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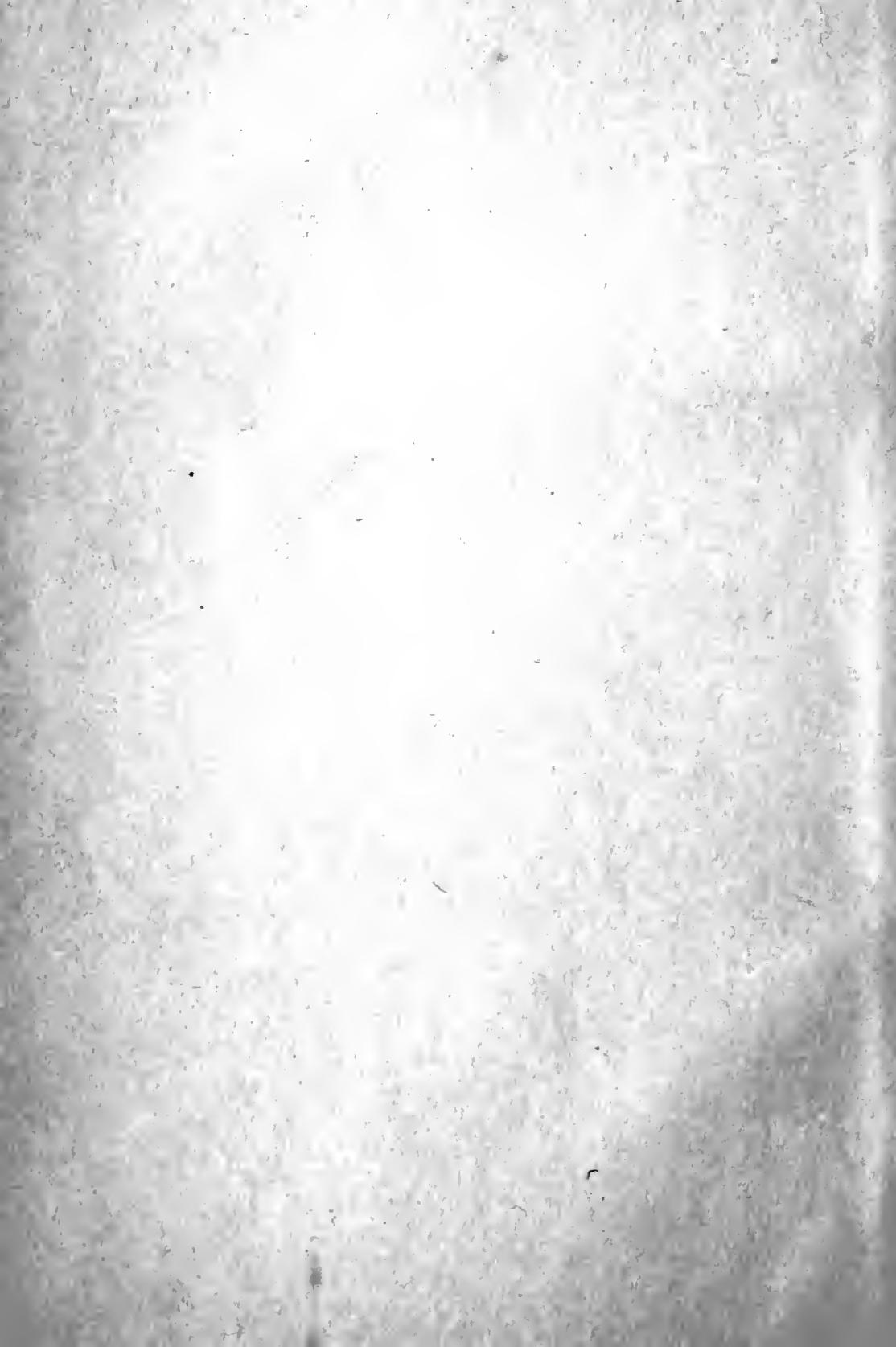
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THE
O I L - D O R A D O
OF
WEST VIRGINIA.

A FULL DESCRIPTION
OF THE
GREAT MINERAL RESOURCES OF WEST VIRGINIA,
THE KNAWHA VALLEY,
AND THE COUNTRY BETWEEN THE OHIO,
THE HUGHES, AND THE
KANAWHA RIVER.

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THE O I L - D O R A D O OF WEST VIRGINIA.

INTRODUCTION.

At a time when so much capital is being invested in Petroleum speculations, accumulative testimony of the richness of the "*Oil Dorado of West Virginia*," will, no doubt, prove interesting and instructive to a large number of persons who have already purchased oil lands or are desirous of so doing.

In compiling this pamphlet we have made ourselves familiar with the reports of eminent geologists and others who have prospected this section of the country, and now lay before our readers a sufficient number of incontrovertible facts which all go to prove that the great oil region of West Virginia is one of inexhaustible wealth.

RICHES OF WEST VIRGINIA AND THE KANAWHA VALLEY.

West Virginia is destined to become one of the richest sections of this great country, for no other state of the Union presents a greater variety of surface than Virginia, from the mountains of the interior, and the rugged hills east and west of them, to the rich alluviums of the rivers. Her hills and valleys are full of wealth, which only needs development to attract capitalists like a magnet, and her mineral re-

sources of coal, petroleum, saline springs, and ores, are second to no other. The Kanawha Valley alone contains inexhaustible mineral resources, large beds of anthracite being found beyond the great valley, while an inexhaustible supply of coal exists on the Kanawha and its tributaries. A great variety of mineral springs, sulphur, warm and chalybeate, are found in the valley district. Copious salt springs abound at the Kanawha and in the southwestern counties, while, now, Petroleum has been discovered at hundreds of points in West Virginia between the celebrated oil wells in Pennsylvania and those of Cumberland in Kentucky.

The deposit of bituminous, splint and cannel coal in this part of the State is also truly astonishing. All the high hills are full of it, some of them containing half a dozen seams, varying from four to as high as fifteen feet in thickness. Passing the valuable coal mines of Mason County, and its reputed oil districts, we ascend the Great Kanawha to the first high range bordering on the Pocotalico. It is understood that this range, consisting of 3,000 or 4,000 acres, has recently been purchased by a Mr. H. F. Averill, for parties in New York city, and that it will be developed at once, Prof. F. L. Vinton, of Columbia college, having been there for nearly three weeks, making a thorough examination of it for that purpose. This point is but thirty-eight miles up the Kanawha from the Ohio River, and is accessible by steamboats and barges at all seasons of the year. Mr. Alfred Edwards of New York has recently commenced to develop coal property on Cabin Creek, some twenty miles above Charleston, and eighty miles from the mouth of the Kanawha, and the Winfred Coal Company, on Field's Creek, near by, are now over two hundred yards into the main hill. The fact is, that there are thousands upon thousands of acres of the very best coal lands in

the valley of West Virginia, all of which must at some day come into the market, and that day will be when the Great Kanawha River is cleared of the shoals just above and just below Charleston, which now somewhat obstruct navigation in that immediate vicinity.

But coal is not the only mineral deposit in these mammoth hills. Large veins of iron ore are found in nearly all of them, and frequently a master vein is discovered of uncommon purity. Seams of fire clay as thick as four or five feet, are also met with, and in the matter of lining stoves and salt furnaces, where coal is burned, this article will soon begin to attract its proportion of attention. Great beds of chalk, lime and plaster are very common to these hills, and every now and then alum and sulphur springs, most highly impregnated, are being brought to light. Chaplain Gregg, of the 7th West Virginia Cavalry, a practical geologist, has collected over ten thousand mineral specimens in this valley and vicinity during the past five years, and from a cursory examination of them, so endless and wonderful in their variety, one cannot contemplate the future of this State without wishing himself to occupy some useful if not conspicuous part in her early development.

PETROLEUM IN WEST VIRGINIA.

Petroleum has been known to exist in West Virginia since 1859, when the oil region of the State began to receive a large influx of speculators and operators, and the lands immediately went up in price equal to what those lands on Oil Creek, Pa., were fetching. The rebellion, however, greatly retarded operations there, but since the subjugation of armed opposition to the government and the driving out of the guerrillas who infested that region, the boring of

wells has recommenced, and there is every prospect that the enterprising men who are there engaged will be fully compensated by the abundant wealth they will realize, and thus discovery and exploration will be stimulated, and the small band of pioneers who first began the development of those vast sources of treasure will ere long grow into a large community of wealthy operators.

The priceless treasure is now being poured forth in undiminished quantity from the wells that have already been bored, and these number few, compared with what we shall see or hear of in the course of the present year, as the further development of the unbounded wealth that underlies the hills and valleys of that State, progresses. That development is, at present, in its infancy, but its growth will be rapid, and before the year 1866 rolls round, scores of adventuresome speculators will count in tens of thousands and hundreds of thousands, and many others who now express their disgust at what they term "*the great Yankee humbug speculation*" will come to grief, and bemoan that they had not enterprise enough to secure some of this unctuous treasure.

THE PETROLEUM BELTS OF OHIO AND WEST VIRGINIA.

BY PROFESSOR WM. F. ROBERTS.

The whole of the State, called West Virginia, comprehends, geologically, the upper, middle and lower carboniferous series of sandstones and shales, in which are interstratified coal—cannel and bituminous—lime-stone, fire clay, and iron ores, of various descriptions, generally rich in quality, and, in some places, abundant in quantity. In West Virginia in every county, in every township, and almost in every farm, coal exists, above or below water level, and iron ores also,

The formation is generally very regular, almost entirely undisturbed. Since its first deposition at least, there is no evidence in any place of trappean, or ejected rocks ; no violent action, or extraordinary upheaval evidences can be seen anywhere. The only locality approximating a disturbed condition of the strata is the so termed "oil break," which crosses the Ohio, near Newport, into Virginia, and thence extends, in a southern direction, to Horse Neck and Bull Creek, in Pleasant County ; to Petroleum, in Wood ; California, on Hughes' River, and Burning Springs Run, on the Little Kanawha, in Wirt County. The same "break" crosses the Big Kanawha, above Charleston ; the Guyandotte, and the Tug, and Louisa Fork of the Sandy, where it enters the State of Kentucky. This so called "oil break" is a simple anticlinal axis of the strata. The dip of the rocks and shales from the crown of this axis, on both sides of it, varies greatly in different localities. Where it crosses the Ohio River, for instance, it forms a gentle curve, shown by the cliffs or ledges of sandstone in the hills both on the Ohio and the Virginia sides of the river. At "Horse Neck" and on the head waters of "Cow Creek" and "Bull Creek," this axis varies but little in form from its appearance on the Ohio. In some places I observed the rocks pitched steep for a short distance, then flattened off again, and thus forming slight irregularities in inclination, but nothing more than is commonly found in coal and other geological formations—nothing extraordinary or remarkable.

At or near to Petroleum, a station on the Parkersburg branch of the Baltimore and Ohio Railroad, the rocks and shales, with accompanying coal strata, pitch at a much greater angle than at any other place on this line of anticlinal, but even here there is no evidence of any sudden violent force having been exerted at any particular time from the result of subterranean action,

protrusions of trap, volcanic, or other similar agencies, notwithstanding the assertion of some who represent the finding of volcanic matter, such as cinders, scoria pumice, magnetic iron ore, &c. At one point, not far from the station, in a railroad cut, the rocks dip at an angle of some 70° , approaching nearly a vertical position, as they rise the hill; but even this dip is not a continuous one, for the same rocks, or at least the upper portion of them, are found curving and flattening off further west, and soon partake of a horizontal position. On the eastern side of the axis the rocks have a more gentle dip, but stronger than that exhibited at "Bull Creek" and on the Ohio. In all these, so much talked of contortions and upheavals, attributed by some to Plutonic action, I could not see anything remarkably extraordinary or wonderfully strange, though it may appear strange to others that I could not detect this phenomena there. The truth is, such appearances are every day sights, common objects creating no sensation in our anthracite coal fields of Pennsylvania, and the twisting and turnings, contortions and convulsions of the coal strata in Schuylkill, Lehigh, Luzerne, and other counties bordering on the anthracite formation of this State, are far more grand, far more extraordinary and wonderful, if you please, than anything of the kind known or existing in West Virginia, the so called "oil break" included.

In the early history of coal mining in Pennsylvania, the outcroppings of the strata were first attacked with pick and shovel. Nature had marked out the place for the drifts by showing in the ravines and on the road sides some little dark washings from the veins. Where these did not appear it was supposed that no coal existed, and in numerous instances has it been the case, where one farm known to contain the black diamonds, because nature had developed them there, was said to be a coal tract, while an adjoining farm,

less fortunate in being nature's favorite in having its coal exposed, was denominated a barren concern, notwithstanding a rail fence only separated the pieces of land.

Some such like ideas seem to creep into the minds of oil men in West Virginia. That the "break" is the only place where Petroleum exists, and that none can be found outside, or on either side of the anticlinal line before described. Nature sometimes exhibits on the surface the indications of the treasure beneath. The uplifting of the strata along the line of the Virginia anticlinal, gives an outlet for the gas which accompanies the Petroleum through the crevices in the rocks and shales, which of course are more numerous and probably larger where this so called disturbance is seen, and hence *oil* springs, gas springs and *burning* springs are found along the line of this broken uplifted strata, and here and there on this anticlinal clusters of oil wells are located, many of them, in the beginning, when the veins were first struck, "over flowed" or "flowed" large quantities of oil, some of them are "pumping" it by the hundred barrels daily. The anticlinal line is the line to locate upon—the "break," on both sides of which mother earth is barren of oil—so say the "break" enthusiasts. But, methinks nature has not been selfish in her oleagenous gifts with us no more than she was in coal. The line fence was no barrier to the continuation of a coal vein from one farm to another in Pennsylvania, and this anticlinal line in Virginia will be found to be the mere outlet or gas escape from reservoirs of oil *outside* of this so called *break*. When wells have been bored and the gas and oil springs penetrated, away off, from this line of demarkation, new outlets will be created, by which the gas will escape from its pent up position in the cracks and crevices, joints and cleavages in the strata beneath the surface, which will relieve, according to

the number of them, the channels through which it now passes to find an outlet to the surface, through the openings formed by nature or those by man, made with the auger in boring for oil, on this line of anticlinal, the line of attraction for "oil men."

It is said that the sun crossing the line causes the equinoctial storm, but methinks there are other causes for the rain about that season of the year than that of the sun crossing an imaginary line. Other causes, too, will hereafter be found to account for the presence of oil along the antecline than the mere fact of the existence of this anticlinal axis in West Virginia being the source and only place of supply of this oil—the so called "oil break." This inclination of the strata as seen at Petroleum continues in a southern direction to Hughes' river, where, in the vicinity of California, the axis is well developed, but with less pitch of the roads. At Burning springs, a tributary of the Little Kanawha, still further south, the dip decreases, and the antecline, instead of "ridge" shape, shows a greatly more flattened appearance. In the valley of this run there were formerly two burning springs, from which it took its name, and here around and contiguous to the site of the springs, which are a mile apart, and designated by the name of "upper" and "lower" burning spring—the earth has been penetrated with the auger from a hundred to three or four hundred feet with circular holes four inches in diameter, and very many of them. Some of these wells were sunk about the time the revolt took place in the South, and were, in consequence of that unhappy event, abandoned by those who constructed them. Probably many of them died on the battle-field, some on this side and some on that, fighting against each other, and these holes are monuments left to show that once they toiled in harmony. Other wells are in active operation and yielding quantities of

oil. Very few of them, however, are bored as deep as they should be. The surface oil is comparatively exhausted, and it becomes necessary in this locality at least to penetrate rocks that have not yet been touched with the drill. Boring is a legitimate business there, and mother earth must submit to be bored a little more yet, ere she will yield greater supplies of this much sought after article of absolute commercial necessity—Petroleum.

THE OIL DISTRICT.

Taking Petroleum Station on the N. W. Virginia Railway (the Parkersburg Branch of the Baltimore & Ohio R. R.,) as a centre, the oil regions of West Virginia as at present explored are each embraced within a circle, with a radius of about twenty miles, and within Wood, Pleasants, Ritchie and Wirt counties. Petroleum Station is situate about 17 miles in a direct line from Parkersburg, although it is 23 miles by the Railroad. This section abounds with a large number of creeks which empty into the Ohio, Little Kanawha and Hughes Rivers, and it is on the banks of these creeks or runs that the oil wells have been bored. The following is a list of them. Middle Island creek, McKinis Fork, Green's run, French creek, McElroy run, Horse Neck, Cow, Calf and Bull creeks, Carpenter run, Ira run, Big run, Briscoe run and Lee creek, all of which are feeders of and empty into the Ohio river. Worthington creek, Taggart's creek, Stilwell creek, Walker's creek, State creek, Turtle run, Lee's run, Creanis run, Ridge run, Standing Stone creek, Tucker's creek, Riffles run, Reedy creek, Dye run, Bridge run, Chesnut run, Sanderson's run, Nettle run, Sulphur Spring creek, Burning Spring creek, Spring creek, East Fork, Little Fork, West Fork, Honey run, 1st and 2nd Two run, Katy's

run, Straight creek, Richard's run, Ann run, Yellow creek and Big Root run are feeders of the Little Kanawha river. Leisure run, Goose creek, Middle Island run and Flint run are feeders of the Hughes River between its junction with the Little Kanawha and where it branches off into two forks. Buffalo run, Addes run, Brushy Fork, Dotson's run and Cabin creek empty into the North Fork Hughes river. McFarland's run, Dickinson's run, Indian creek, Leather Bark creek, Grass creek and Spruce creek empty into the South Fork Hughes river.

Throughout the district the geological features are remarkable. On the summit of the highest mountains as well as in the depths of the lowest valleys, distinct and marked traces of a most violent upheaval are distinguishable. The rocks are in some places almost vertical.

It is generally believed that oil is confined to the break, as the upheaval in West Virginia is called, but whether such is the case, it is impossible to say; but it is an established fact, that it can be found at any point along the line of the "break" where wells are bored to a proper depth. In many places along this line of upheaval, oil and gaseous compounds issue spontaneously from the earth, from fractured rocks, the beds of streams and mountain sides. The greatest number of fissures and crevices are found, where the most violent geological disturbance has taken place, and these fissures must of necessity be filled with the precious distillation where oil abounds. Rogers, the celebrated geologist in a report of his survey of Virginia, 1839-40 states that the most abundant artesian salt wells, with their almost invariable concomitants, the liquid and gaseous hydro-carbons, were found situate upon, or nearly co-incident with, the artificial archings of the strata.

It is not our intention to discuss the origin of Pe-

roleum or to speculate upon the source from which the supply is derived in other localities, but we state incidentally that in West Virginia it is clearly furnished by the carboniferous formations.

This oil section being scattered over a considerable extent of territory, many persons from the east who visit it, see but little of it. They spend a few days there and see the operations on two or three of the creeks and report, on their return home, that they have traversed the whole of the Oil Region, whereas they have seen but a very small part of it. To make themselves thoroughly familiar with the vast resources of this region, they should spend weeks and visit the wells that have been and are being bored on the various creeks and runs that we have mentioned. At most seasons of the year the roads are tolerably good, considering the broken country through which they run. By thus extending their observation they will see enough to convince them of the vast depositories of wealth which there lie hidden beneath the hills and valleys, in the reservoirs which nature has provided to receive these wonderful treasures to illuminate and lubricate the world.

CONDITION OF THE COUNTRY.*

The oil region of West Virginia is comparatively undeveloped. About the commencement of the war, a determined spirit of speculation began to manifest itself. Speculators and operators swarmed into the country, and prices for lands went up to Oil Creek figures. A few successful borings were made at the Burning Springs, on the Little Kanawha, and on Oil Run, near the Northwestern Virginia Railroad, at Petroleum Station. The Rathbones, at Burning Springs,

* From a letter of Colonel De Hass.

Wirt county, struck a flowing well, which yielded, probably, one thousand barrels per day. Quite a number of wells were commenced ; but the war waxing warmer, and the "sword" being "mightier" than the *drill*, the borers skedaddled, and guerrillas, by the way of *divertissement* between the acts of rapine and blood, "raised the devil" generally by forcing the carbureted hydrogen, which escapes so freely at the Burning Springs as to give origin to the name ; and, opening the oil tanks upon the water, literally "set the river on fire," lighting up the dark valley with its deeply-wooded banks, as the burning fluid flowed luridly past ! These amusements lasted during the first summer of the rebellion, but more active work being on hand for the marauding pyrotechnists, the scene shifted, and comparative peace once more reigned in the valley of the Little Kanawha and Hughes River.

Adventuresome oil speculators, however, did not return. Wells abandoned at a moment's notice, in a half finished state have continued to emit their gaseous contents undisturbed, almost up to the present writing. Those wells which had penetrated the oil receptacles, and commenced yielding the oleagenous treasure, were not permitted to lie idle ; but as soon as the bushwackers *vamosed*, the owners returned, and, with little interruption, have continued to work them up to the present time. There being no longer apprehension of danger, the abandoned wells are now to be bored through, and the whole oil territory fully developed. The high price of oil, with the continued failure of the Pennsylvania wells, have contributed to the renewal of operations in this region. That a vast field of wealth is opening up to enterprising capitalists, there cannot be a reasonable doubt. Oil exists here in really wonderful abundance. Parties now sink wells with almost the certainty of procuring oil as in other localities wells are sunk for water, in the

fissures of rocks, in the sand and mud, from which it can be disengaged by slight manipulation, or stirring with a stick. It is found oozing from rocks, and beneath the surface at variable depths from one to three hundred feet. I mention the latter as the extreme depth to which any well has been sunk in this district. The ordinary depth of wells is from one hundred and twenty, or even less, to two hundred and fifty. In but few instances have wells been carried to a greater depth. What do these facts teach us? That all the oil heretofore procured has been little more than the surface supply! The true oil receptacles lie far deeper, and he who drives, by force of steam, the chisel to a proper depth, will be abundantly rewarded for his industry and labor.

PETROLEUM NO NEW DISCOVERY.

The evidence of oil in Western Virginia is no new discovery. Jesse Hughes, a famous Indian hunter and borderer, from whom the Hughes River derives its name, had occasion, in more than one instance, to test the healing properties of oil found floating upon its waters. Certain it is, those who composed the next wave in the advancing tide of civilization—the rustic pioneer, who, by the force of his brawny arms let sunlight into the forest, reared his cabin and planted his crop of corn, knew the value of Petroleum, or "rock," "bank," and "sand" oil, as they variously called it. It grew into popular use, and no cabin was secure without a supply of "rock" and "goose ile," which medicaments were regarded as essential to the proper physical culture development of the rising generation. Oil grew into general use, and soon became an article of traffic.

Of those who settled near the forks of Hughes River, at an early day, was George S. Lemon, from

Bath County, Virginia. He was a tough *lemon* to squeeze, either for bears or pugilists, for he was a man of herculean frame and great vigor. Even now in his seventy-eighth year, and stricken with palsy, he shows what he was in his better days. When Mr. Lemon first emigrated to Hughes River the business of gathering oil for traffic was little practiced ; but, trading to Parkersburg and Marietta, he found there was a ready market for it, and commenced collecting it for sale abroad. Those who had heretofore gathered, did it for neighborhood traffic. The plan adopted by Lemon, as I have derived from himself and family, was, to commence about the 1st September, (when the streams were low, and the oil supposed to be nearer the surface,) and prosecute the work until about November 1.

THE DISTRICT AROUND PETROLEUM.

About one and a half miles due north of Petroleum in Ritchie County, are the wells of a Wheeling company — fourteen in active operation. This company, which had commenced operations near Wheeling some five or six years ago, in the distillation of hydro-carbon oil from bituminous shale, had their attention directed hitherward by the discovery of coal, which, it was believed would render a greater percentage of oil than that which the company were working near Triadelphia, Ohio County, Virginia. About this period, the discovery of oil was made on the Alleghany, in Pennsylvania. A sagacious and practical member of the firm at once concluded that oil could be obtained in the valley of the Little Kanawha by boring, as its existence in springs had been known for years. Accordingly he selected a site on a small stream called Oil Run, purchased an hundred or more acres, and leased a thousand more. Operations were

speedily commenced, and *oil oh!* soon crowned their efforts. The experiment was a success, and other wells were speedily sunk. The "fever," as the greasy inspiration is popularly called, rapidly spread. Lands went up and wells went down with amazing haste. An "ancient and *pitch* like smell" overspread the country. Had the rebellion not then broken out, who can tell but that the valley of the Kanawha may long ere this literally have overflowed with oil. The "fever" yielded under the excessive depletion inflicted by the sword. Speculators skedaddled, guerrillas swarmed around the Burning Springs, and, by way of amusement, applied the torch to the carbureted hydrogen gas which escapes so freely at all these springs, and by its highly inflammable character has given the name to the celebrated Burning Springs of Wirt county. Oil stock went down during the first three years of the war, if the rebellion did not; but guerrillas having tired of their work, and the world needing light and lubrication, operations in the oil region have again been resumed, and the spirit of boring has again become manifest. It may be proper here to remark that the wells near this place have not been materially interrupted during the war. Those in Wirt County have suffered the most, the destruction having been general and indiscriminate. A new impetus has been given to the oil business by the discovery of oil in large quantities on Horse Neck and Bull Creek, about fifteen miles from this point toward the Ohio river.

YIELD OF WELLS.

I have already stated that the company operating here have fourteen wells yielding oil. They are all in the valley of Oil Run, and within a distance of one mile. They are all worked by a simple contrivance,

driven by a single engine. The arrangement is creditable to the ingenuity of Mr. Hamlin, a member and chief manager of the company. The wells have a depth of from seventy-five to two hundred and thirty feet, thus showing that the oil is not confined to a horizontal receptacle, as commonly believed.

The oil from all these wells, with the exception perhaps, of two or three, is a heavy, dark, green fluid, with a specific gravity of about forty degrees. The other wells yield a lighter oil. The former are finely adapted for lubricating purposes, the latter for illuminating use ; but as the company have a contract with the Baltimore and Ohio Railroad Company to take all their oil, the product of their several wells are run into a tank and subjected to a temperature sufficient to cause them freely to mix. They are brought to a specific gravity of about fifty degrees, and barrelled for shipment.

The monthly yield from these wells is over two hundred barrels ; but every well might be made to yield five times as much as now produced, by sinking deeper ! These wells have yielded over four hundred thousand barrels per annum for many years.

THE PROCESS OF BORING.

The process of boring is simple. A tall derrick is erected over the spot selected for boring. The derrick supports the tackle, &c., for drilling. A small engine, with much of the machinery improvised on the spot, drives the descending chisel, &c. The drilling and paction is a simple contrivance. The drill is about two feet in length, with a blunt flattened end about twenty-five feet of iron shaft weighing over four hundred pounds. The whole is secured to a stout cable, which, passing over a windlass, is worked by the engine, and controlled by one hand, who is relieved in

turn, the two acting alternately as engineer and assistant.

I had forgotten to say that, in commencing operations, an iron tube, in joints of about ten feet in length, is let down into the earth until it rests upon rock. The drill then goes to work, and as it descends into the varied stratification, the tube follows. The drill having been driven to its length—ten feet—is withdrawn, and a sand-pump let down to remove the accumulated *debris* at the bottom of the well. The force pump is a copper tube, about eight feet in length, its diameter slightly less than the well, and supplied at the lower end with a valve opening upward. It brings up the contents of the well very thoroughly, which are examined with much anxiety by parties interested.

ROCK OIL, ITS GEOLOGICAL RELATION AND DISTRIBUTION.

BY PROF. E. B. ANDREWS, MARIETTA COLLEGE, OHIO.

My investigations have been directed chiefly to the oil of the coal rocks, and I propose in this paper to give some of my results.

The rocks of Western Virginia and South Western Ohio may be divided into three classes, those which are almost entirely horizontal, those which have a dip of from fifteen to forty feet in the mile, and those which are broken and dislocated by an uplift. The strata of the Ohio River at Parkersburg up the Little Kanawha to within a few miles of the great oil wells are very nearly horizontal and probably contain few fissures, except such as may have been produced by the drying and shrinking of the rocks. There is not to my knowledge a single productive well in that region, although a large number of wells have been bored. The compact and broken clay shales and other

strata rest upon the deep bituminous strata and furnish no spaces through which the oil vapor could rise. Probably no such vapor is formed.

On the Great Kanawha River, at Pomeroy and vicinity on the Ohio River, in Athens, Morgan, Noble, Washington and other counties in Ohio, located on the coal measures, the rocks have more or less dip, and contain, as a probable result of the uplifting force, many fissures. These counties all furnish oil—Noble and Washington in considerable quantities. The salt wells on the Great Kanawha, at Pomeroy on the Ohio, on the Hocking and Muskingum Rivers and on Duck Creek, revealed more or less oil. But it is in regions where the strata have been the most disturbed and where the fissures are the most numerous, that the most oil is found.

I have recently traced a most interesting line of uplift and dislocation from the eastern part of Washington County, Ohio, to beyond the great oil wells on the Little Kanawha River. The direction of it is nearly north and south. It makes an angle of about 40° with the general course of the Alleghany Mountains.

As seen in Ohio it presents a well marked anticlinal axis but with the eastern slope more steep than the western. At the anticlinal line are gas and oil springs. Fifteen or twenty miles further south, near Petroleum, Ritchie Co., Va., the uplifting force has been greater, and the strata have been broken apart and now stand at an angle of about 50° . These strata contain seams of cannel and bituminous coal, and are altogether new to me. A few miles further south and on the line of this geological disturbance we find, near where the Hughes River crosses the uplift, many new and interesting strata, which have been lifted up from considerable depths.

Between this point and the Little Kanawha River

the anticlinal line is easily traced, the rocks inclining to the east and to the west at annules varying from 28° to 8° . The rocks are well exposed on the head of Standing Stone Creek, and at other points.

COAL OIL IN WEST VIRGINIA.

BY C. H. SHATTUCK, PARKERSBURGH, WEST VIRGINIA.

With the oil excitement at its height in Pennsylvania, of course it was not long before the coal oil business of West Virginia began to teem with busy operators, and enterprising capitalists diligently engaged in collecting the rich stores of Petroleum which were discovered in her territory. The first operators in Virginia were J. T. Johnston & Co., from near Pittsburgh. These parties commenced their operations on Hughes river, Wirt county, in November, 1859. They bored a number of wells with varying success. Soon after Messrs. Hazlet & Co., of Wheeling, began to operate in the vicinity of Petroleum, (a small town and station named from the product of the region,) on the line of the North-Western Virginia Railroad. These gentlemen were more successful than the parties last named : and this same vicinity has remained one of the most prolific portions of the oil regions of this State. We are at this time unable to give accurately the yearly yield of this region, yet we know that it has been and is still very great.

* In the spring of 1860, Mr. T. D. Karnes leased, from Mr. John V. Rathbone, an old well which, in former years, had been bored for salt purposes. This well was situated on the Kanawha river, in Wirt county, eight miles above the town of Elizabeth, the county seat. In the hands of Mr. Karnes it proved very productive, yielding from fifteen hundred to two thousand gallons daily.

The oil now commanded a good price in the market, and it became manifest that this region (known as Burning Spring, from a gas spring in the neighborhood) was certain to reward the labors of operators. The attention of many was immediately turned to this district, and when, in December 1860, Mr. J. C. Rathbone bored a well, and pumped from it daily from eight to ten thousand gallons of oil, the excitement became great. There were now three districts producing abundant supplies of Petroleum in West Virginia. Men of all classes—mechanics, lawyers, laborers of all kinds—turned their feet in this direction, and soon became actively engaged in the business of procuring oil. All the land in the immediate vicinity of the working or producing wells, and much at a distance from them, was leased or purchased by capitalists eager to embark in the business. Buildings in the neighborhood, which had rejoiced in the name of hotels or inns, were speedily crowded to overflowing; quiet farm houses, hitherto humble and unpretending dwellings, were forced from a quiet obscurity to a bustling notoriety. The farms of J. C. and J. V. Rathbone soon became a city of huts. Nothing could be seen but great piles of barrels, derricks, scaffolds, and cisterns; nothing heard but the puff of the steam engine, and the click, click, of the drill.

West Virginia now began to rejoice over her newly developed sources of wealth, and to look forward to a bright future. The "peculiar institution" of Virginia had hitherto excluded many men from her limits. Indeed, so well understood had this fact become, that many of her best men, although not generally opposed to it, regretted the domination of this power here. Yet all now indulged the hope that the day was dawning which should see, before its noon, the wooded hills and neglected valleys of West Virginia doffing their rugged garb, and putting on the robes of

a thorough and expanded cultivation ; and, as preliminary to this, they hailed with a welcome the coming of those who, reared and trained in the practice of active and honorable industry, should give their labor and substance to the development of the resources of their State. But these hopes were of short duration. The active efforts of those who had moved to the new field of labor were only well begun when the hostile shots were fired upon Fort Sumpter. There were heroes sweating and delving in the oil regions as well as elsewhere.

The promises of wealth which the oil regions had made, and which now seemed about to be realized, were forgotten. Princely fortunes lost their charms when an imperilled country called her sons to her defence, and now those who but recently came to these localities to pursue the avocations of peace, departed to practice the arts of war.

Operations on any extensive scale were now impracticable ; and even if splendid results had not been impossible on account of a scarcity of laborers, the murderous raids of guerrillas would have completed what the other began. A few who remained and endeavored to perpetuate what had been so well commenced, labored on, notwithstanding the new difficulties. Yet the predatory incursions of guerrilla bands made any large shipments of oil almost impossible. Nevertheless, despite all the obstacles thus interposed, and which were understood fully only by those who have been compelled to contend against them, there was produced at the one point of Burning Spring alone, in the year 1861, four million gallons of oil. In the year 1862, three millions two hundred thousand gallons were sent to market from this same point. The product of 1863 does not, probably, exceed two millions of gallons.

When, however, it is remembered that this large amount of oil was produced in one section alone of not over one mile square, and under circumstances the most unfavorable to production, the reader may form some idea of what might be done under circumstances that would deserve to be called auspicious.

It must not be supposed that, in estimating the oil interest of West Virginia, the small tract or point just named embraces the entire oil-producing district of the State. Explorations made for the discovery of oil in West Virginia, it must be remembered, had only begun three years since. The force of circumstances concentrated the efforts of explorers in the territory around this district. Oil was first discovered here in abundant quantities. People naturally flocked to this point, and before curiosity and investigation had been able to exhaust the object of attraction here, and turn to search for new fields, the so-called secession of Virginia, with all its baneful evils, fell like a blight upon the land. While the supply from this district was diminished to some extent, other regions, unexplored, some of which are now proving as productive, remained untouched.

These territories, from which enterprise was banished by the war, remained, with all their mineral and oleaginous wealth, unrevealed, quietly waiting the time when, without the din and perils of war, the men of toil could enter the subterraneous chambers, and bring forth their treasures to the world. This period has at last arrived. Steadily the rebellious forces have been pushed and driven back, until this portion of West Virginia, at least, can be said to be entirely free from them. Men begin to feel again that they are safe and secure under the old government, and with this feeling comes the revival of business. But few days have elapsed since the development of an entirely new oil district. A few months since, Messrs.

J. B. Blair & Co., began operating on Bull Creek, and at the depth of 160 feet, on the 16th of March, they struck a vein of oil which has continued flowing at the rate of a thousand barrels of oil per day since. A curious fact connected with the oil beds here is the following: Commencing at Burning Spring, on the Kanawha river, we trace a belt or upheaving of the rock, causing a vein of rock some 20 feet in width to stand perpendicular on its edge, and running north one degree east, crossing Hughes river at the oil wells already spoken of; also crossing the railroad near the oil wells of Hazlet & Co., and crossing Bull creek at the wells first spoken of, Messrs. J. B. Blair & Co.'s; thence on and crossing the Ohio river, the oil district appearing to follow this upheaving or rather this up-heaving appearing to designate where oil exists. All along this line may be found gas or burning springs. As these gas springs are an excellent indication of oil, it may be safely said that oil will be discovered the entire length of this belt, thus giving West Virginia almost treble the amount of oil territory to that of Pennsylvania. Already borings have commenced on and all along this line; probably there will not be less than one hundred wells sunk this season at different points, yet undeveloped, between Burning Spring and the Ohio river. That many will be successful cannot be doubted. Professor Rodgers, in an able article on the history of Petroleum, brought out last July, believes the great basin to be near the Ohio river in this State. Indeed, the large yield of the wells on Bull creek, five miles from the Ohio river, recently discovered, would seem to be proof of this assertion. It is not intended here to discuss the theory of the origin of Petroleum, nor yet its composition, or the gravity of the several oils obtained in West Virginia. In regard to the latter, suffice to say they differ little from the Pennsylvania oils, a very able

report of which we have from Professor J. B. Lesley, just published. Indeed, these great oil bearing districts differ but little in any respect, both being hilly, clayey soil, well watered, and with an abundance of timber.

It will be observed that the yield of Petroleum here during the year 1863 is less than former years. This, however, cannot be taken as an index of the real productiveness of the region ; it may be said this was all that was brought to market.

In May last, the Rathbone district was, together with all the apparatus, burned and entirely destroyed by the rebel forces under General Jones. Twenty thousand barrels of oil were burned with it. The losses were heavy, and, of course, were severely felt, both in material destroyed and time spent in re-building ; had these disasters been averted, the yield would have been equal to former years.

We rejoice to believe that the day is now come when, in peace and without hinderance, West Virginia will be permitted to demonstrate the true extent and richness of her oil districts. The wise and energetic administration of the affairs of the State is beginning even now to tell in its behalf.

Oil is brought to Parkersburg, the general oil market of the State, from Burning Spring during the spring and fall, by flatboats on the Kanawha river, at a cost of seventy-five cents per barrel : other seasons when the river is not navigable, it is wagoned at a cost of two dollars per barrel. It is well to mention here that a bill has recently passed the Virginia Legislature for the improvement of this river. A company has already been formed, sufficient stock subscribed, and we may expect that soon the Kanawha will be navigable all the year.

From Hughes river and Petroleum districts the oil is hauled to points on the North-Western Virginia

Railroad, at a cost of twenty-five to fifty cents per barrel, and from Bull Creek it is hauled to the Ohio river at a cost of fifty cents per barrel.

GEOLOGICAL AND MINERALOGICAL REPORT UPON
PETROLEUM LANDS SITUATED IN THE STATES
OF OHIO AND WEST VIRGINIA.

BY W. F. ROBERTS, GEOLOGIST.

On the line of the "great upheaval ridge," otherwise called the "Oil Break," an anticlinal axis of the stratification, running in a north and south direction through the States of Ohio and West Virginia, the most productive and profitable oil wells have been bored. Many celebrated localities for Petroleum, such as Little Muskingum and Duck creek in Washington County, Ohio; and Bull creek and Horse Neck, in Pleasants; Petroleum and Goose creeks, in Ritchie; and Hughes river and Burning Springs run, in Wirt Counties, in West Virginia, through which this "Oil Break" extends, are noted places for flowing and pumping oil wells, and previous to the commencement of operations in boring for oil, this line of anticlinal was remarkable for the numerous gas and oil springs, found in places along it, some of which could be ignited readily and would burn continuously. These surface "signs" as they are termed, led "oil men" to these particular spots to bore, and success generally has been the result.

The first tract of "oil land," a part of the property I am desired to report upon, is on "Rawson's" run and tributaries, a mile south from "Horse Neck," where the famous "Gilfillen" well was bored, which flowed so copiously. "Rawson's" run is a most important location. On it the celebrated "Tack" well is located, with others of note belonging to the

"American Oil Company," "Sharp and McKinney," Campbell, &c. These profitable oil wells, which are yielding princely revenues to their owners, are adjoining the "Maston Farm," and on it, the *selfsame* surface evidence for Petroleum exists, as those seen at the places where these productive wells have been bored, and the same as those seen on "Horse Neck" previously ; and moreover, this tract of land, embraces the same geological characteristics and topographical contour as the others, and lies immediately on the same "Oil Break," the same anticlinal axis of the strata, which crosses Horse Neck at the Gilfillen well and extends in a direct line through this "Maston Farm" which is only a short mile from Horse Neck. The same causes produce the same results generally, and there is no reason to doubt the existence of immense supplies of Petroleum underneath the "Maston Farm." Rawson's run, on which the Maston property lies, is a branch of "Horse Neck run," which is a tributary of Bull creek. These runs are about five miles from the Ohio river, and is the first greatly important Petroleum locality after crossing the Ohio in Virginia. It is in Pleasants County. The shipping wharf is at the mouth of Bull creek.

The Maston property presents a large amount of boring territory, the ravines are deep cut and the ridges deep sided. The tract is well timbered with various useful kinds of wood. There is on it a fine growth of white oak, which will become valuable when the property has been fully developed for oil, in the manufacture of barrels and tanks, for which purposes, this kind of timber is adapted. The land, when cleared, makes good farming land and yields good crops. But its surface value is small in comparison to the worth of the Petroleum beneath, which may be drawn off from the cavities and crevices in the rocks below ; within the boundary lines of this tract of land,

and in it is a vein of coal five feet thick, which supplies all the wells around Horse Neck with fuel.

The next location, to which my attention was directed, was to other Petroleum lands situated on tributaries of "Fifteen Mile" creek, an affluent of the Little Muskingum river, in Washington County in the State of Ohio, and lying on the same "Great Oil Break" above spoken of.

The "Burning Spring tract" is situated on a branch of Mill Fork, a tributary of Fifteen Mile creek. The name of this tract is taken from an oil spring of large size, one of the most extensive I know of, which burns from several jets of gas from below, and apparently constantly and regularly supplied. The celebrated "Paw-paw" oil region lies north of the territory I am reporting upon. The anticlinal axis, or so termed "Oil Break," crosses these tracts of land. The hills here are of the same geological formation as they are further south along the line of this "Oil Break;" the strata consists of sand stones and shales, with limestone, iron ore and bituminous coal veins intervening. One coal vein in this part of the country is seven feet thick in places where it has been opened.

Lubricating oil, the most valuable in the market, worth twice as much as illuminating, on account of its scarcity, will in my opinion be reached on "Mill Fork," where the lands I am speaking of are located, by boring a moderate depth. The illuminating oils, of course will require deeper wells to tap them. The greatly productive oil localities of "Cow Run" and "Newell's Run," where wells are yielding largely, are south of the places referred to in this report. Hence the farms above named are admirably situated in all respects, geologically and otherwise, and promise to become, when properly developed, important productive and profitable territory.

ANOTHER REPORT.

Professor Peter F. Stout, Geologist, of Philadelphia, says of a tract on Carpenter's Run : Upon Carpenter's Run I observed many indications of oil existant. The bubbling of gas in the stream at various points, saponaceous or oily matter following the gaseous exhalations, pebbles discolored,—evidences of the existence of latent oil. Following this stream to the western-most boundary of the property, I saw many other surface indications. The geological disturbances here were observable. Upon the other streams the same indications were prevalent. I am of the opinion that it will prove good Oil Territory. I was favorably impressed with the Estate, as well in regard to locality as to development.

FROM WAYNE COUNTY, WEST VIRGINIA.

I was at Catlettsburg, Ky., yesterday, and met one of the three Massachusetts men here prospecting for oil. There has not been much excitement on the subject, for the reason, I suppose, that it is not safe for the men to go up the country. There is plenty of oil, I believe up the Big Sandy river. At least, there are abundant indications of oil, and two springs that will burn ! One called the Burning Springs, is thirty-seven miles from the mouth of the Sandy, in Wayne county, near the Logan county line. I have never seen it; but heard it talked of and described many times. Not at all times, but most of the year, the spring will burn if set on fire, and has been known to burn for several weeks. Before the war, several wells were sunk on the Kentucky side of the river, but before anything was realized, the secesh excitement became so warm that men could not operate with safety. The strangers, who have lately been here, have decid-

ed not to try to do anything until spring. They express themselves satisfied with the prospect. Commencing ten miles from the mouth of the Sandy, and extending to forty-seven miles from the mouth on both forks, the surface indications of oil are found, and in every place where they have bored, it is made certain that there is oil. Cannel and bituminous coal is also plenty. There is good prospect that a railroad will be built on the Virginia side of the Sandy, forty miles up into a marvellously rich coal region. When that is commenced, the oil wells will be numerous enough.

SALE OF CONFISCATED REBEL FARMS.

Recently a sale was had at public auction of a fine lot of farms in the adjoining county, belonging to rebels before the war. A large number of loyal men of that county, who were never in the United States service, but have been arrested and sent to Richmond, or otherwise maltreated, brought suits for damages against prominent rebels who have abandoned their homes here, and gone into Dixie for personal safety, or are in the rebel army. Judgment was easily obtained, and the real estate of the absent rebels has been seized to be sold and pay the damages. I know of no better investment for capital in West Virginia. Certainly nothing could be safer or more sure to be profitable. There are about thirty of these farms, and 20,000 acres of land. One tract of 1465 acres belonged to the late rebel General Jenkins, is situated on the Ohio, and is nearly all very beautiful rich meadow land. Some of the farms are in a section called Terry's Valley, finely located, rich soil, with young orchards, and good roads to the Ohio river. Terry's Valley is fifteen miles from the mouth of the Guyandotte river on the Ohio, by the turnpike, and ten

miles to the nearest point on the Ohio. Nearly all these farms, now referred to, were kept in a high state of cultivation, and produced abundantly. I have often admired that part of the country, and wondered why northerners who occasionally get into these pleasant places have not more of them got in there. This property belongs to wealthy and aristocratic citizens of West Virginia who owned negroes, despised "mudsills," and felt that it was their duty to go off with their brethren of the east into rebellion. What personal property they could carry with them they secured, intending to come back and occupy their real estate when they had conquered the federal government, and made it safe to do so. But it is now all securely in the possession of others.

WEST VIRGINIA AS A PLACE TO LIVE IN.

I could not conscientiously recommend any one to come here now to live, although investments in farms will surely be profitable. The trouble now, chiefly, is, that the guerrillas have broken up their organization, if they ever had any, and scattered into small squads to rob and steal. A schoolmistress, passing along a lonely road not far from Ceredo, was robbed of all her money, the amount she had just received for three months' teaching, by three ruffians. A few nights ago three men went to the house of a quiet farmer, one mile from Ceredo, and robbed him of a few dollars, all he had, and boots and some clothing. Some of the citizens keep arms in their houses, and intend to use them if visited in that way. One of these shot one of a gang of six one night not long ago, but became frightened himself, and ran off, giving the robbers a chance to take their wounded companion away. He has not been troubled since. Gen. Crook, commanding the Department of West Virginia, has issued a

circular notifying the people that they must organize for their own protection, and recommends them to hunt the bushwhackers and kill them. Governor Borenman offers to furnish arms and ammunition. It will be done, and the guerrillas, will decrease every week, I hope.

WEST VIRGINIA AND OHIO OIL REGION.

The editor of the Boston *Commercial Bulletin*, the best authority in New England on Petroleum and mining matters, has just made a horseback tour through the Ohio oil regions, and refers to them as follows :

"The richness of this portion of the oil producing country running through West Virginia and southwestern Ohio, is attracting the attention of capitalists. The great oil belt of Ohio in particular, which has received but little attention in comparison with other localities, gives unmistakable indications of an immense deposit of oleaginous wealth.

"We have recently made a thorough personal examination of a large portion of the Ohio regions in company with an early explorer and also an old pioneer, who years ago was wont to travel over them with axe and rifle on hunting expeditions—long before the oil springs were thought to be anything more than a curiosity—and in comparing the indications and external appearances as well as present developments with those of Venango county, Pa., which we visited last fall, we shall not be surprised at even richer developments here than those of that now noted country.

"It is an established fact that the Ohio oil is of more than double the value of Pennsylvania, owing to its superior quality and purity, while the large deposits of coal on the oil lands renders fuel literally, 'cheap as dirt.'

"We met during our excursion, two or three

representatives of Boston capitalists, who, with that caution which belongs to our merchants, had gone out to see for themselves the character, position and probable value of the property before making investments. Besides the satisfactory tests showing the presence of oil, and the quality of that obtained from the wells already sunk, those who purchase in this locality now will probably be able to buy either of the original owner or first purchaser, while the Pennsylvania region farms have changed hands so often that there is but little chance at this time of obtaining any that are not worthless, except at fabulous prices."

LAND TITLES IN WEST VIRGINIA.

Among the subjects which ought to require the strictest attention, from persons who are about to invest in the stock of oil companies, there is one matter of the most vital importance, which in the headlong anxiety which exists to make money, is very generally overlooked. In ordinary transactions, which are connected with transfers of real estate, or interests in it, no sane man would pay a dollar upon any bargain, unless by the advice of a good lawyer or conveyancer, that the title was good, and that he was acquiring something which he could hold. To buy a law suit is not a popular method of investment, and hence the property owner, before parting with his money, takes the best advice. In this city the business of conveyancing has become a strict methodical science. Before a lawyer or a first class conveyancer will pass a title, he requires to be satisfied on many points. Astute conveyancers frequently find difficulties about past transfers, and trouble is given to obtain releases from parties who are supposed to have nominal interests, or proof is required that certain persons who have held contingent claims during their lives are actually dead.

Should all these matters prove satisfactory, the lawyer or conveyancer is prepared to "pass the title," the money is paid, and the new owner enters upon his purchase under the belief that his title is indefeasible.

There is no description of real estate which requires more precaution, care and attention in the purchase than oil property, and no man should take hold of any leases in West Virginia without having had them thoroughly investigated. The titles, especially in Western Virginia, are mostly very defective, and leases, in a great many cases, have been taken up by mere boys, who did not know how a lease had to be legally made, who in addition to this have made up descriptions of the leased lands in such a shape, that when one comes out and compares the laws with the leases, he finds everything wrong and worthless. A law firm in this city, whose advertisement may be found on another page, has therefore, established a branch office at Parkersburgh, for the purpose of investigating titles, drawing and executing deeds, etc.

A VISIT TO THE OIL REGIONS OF WEST VIRGINIA.

BY JOHN RUSSELL YOUNG.

The Little Kanawha Valley.—In arranging my tour through the oil regions as the representative of the Press it occurred to me that, as West Virginia presented more romantic and peculiar features than any other part of King Petroleum's new and marvellously extending domain, it would be well to bend my steps thitherward. So I found myself in the cabin of a cosy Ohio steamer, sluggishly steaming along the narrow and long river that separates Ohio from Virginia. It was a cold November day, but we managed to coax enough sunshine out of the leaden skies to

make our trip rather pleasant. It was in the morning when we left Wheeling, and the night was far advanced when we reached Parkersburg. A reconnoitering party reported that there was neither room nor entertainment for man in the town, and we were content to pass the night in our little cubby holed state rooms. As the boat returned before sunrise, we were driven on shore by a pertinacious clerk—sleepy, sullen and hungry—and disposed to be resentful towards the falling rain. I should certainly recommend Parkersburg to any gentleman whose propensities are amphibious. The delightful uncertainty as to whether we were on land or water, and the ingenuity with which every deceptive pool was scanned, would have been charming to philosophic men. We were not philosophers, who had huddled around the stove in the bar-room of the Swann House and looked at the barkeeper deprecatingly, as men who had neither house nor home, and, therefore, were in the condition of uninvited guests or poor relations. We were nothing but poor oil hunters, who came merely to get rich. We had heard of the many feasts, and the great good things that Petroleum was giving his subjects, and we came as crumb-hunters. Where so much was given there might be something to spare, and what is the use of working for a living when we can prosper by our wits? I believe this was the feeling of a majority of all who splashed through the mud and groped their way to the hotel. One of them was a sight-seeing gentleman all the way from England, who carried with him a number of old fashioned trunks, and, not being in the oil business, felt disposed to be cross. We became friends, for I had neither oil stocks nor oil lands, and no interest in King Petroleum beyond the bright, golden, dazzling light that brightens up this page as I write. So we felt the sympathy of petulance, and the vengeance bestowed upon ill natur-

ed domestics and tardy waiting men, was sublime. My English friend gave us a dissertation upon coffee that astonished the breakfast-table, and when, after rejecting four cups, he expressed a profane willingness to go down into the kitchen and make it himself, the money-changers and speculators of Parkersburg began to feel that there was one of the number who could not be tempted into an uncomplaining allegiance to the new regime. I gave that Englishman my love, and when he told me through two weary hours, about the hounds of Yorkshire and the many virtues possessed by his cousin, the Lord of Roastbeef, I felt that my self-denial and long suffering found a slight return for his frankness and energy.

PARKERSBURG.

Parkersburg is the oil metropolis of the West Virginia District. At the junction of the Ohio and Kanawha rivers, and connected with the north and west by a branch of the Baltimore and Ohio Railway, it commands all the trade of the West Virginia Valley. It is within easy distance of Marietta, the metropolis of the Ohio district; of all the railway connections of the country, and but thirty-six hours from New York or Chicago. It is a straggling, imperfect unfinished town, which had, in earlier days, been prosperous, but upon which the blight of war had fallen and dried up the sap and vigor. Many rich men live here. How rich men could content themselves to live in a place as this, is a mystery of money-getting that I cannot explain. The oil princes—to use a common phrase—do not spend all their wealth here, however. They make their money and hurry away with it, regarding this as a kind of oily Rialto, where good money is to be gathered up and carried to other markets. The class of men who live here are, therefore, unlike the men who

ploughed up California and are now ploughing up Colorado. There is very little gambling, no bowie-knives, and little of that primitive civilization which disgraced the Pacific coast and made a vigilance committee necessary. We are so near New York and Philadelphia that capitalists can come and see for themselves and return in ten days. The only difficulty is with the guerrillas. If a man is nervous and not a believer in predestination he had better not venture far beyond the regions of Burning springs. Still this is merely a fear, that looks dismal when read from newspapers in Northern parlors, but is laughed at in Western Virginia. In 1861 there was really cause for alarm. In 1862 the guerillas had complete possession of the country, and a man's horse was about as safe as the life of a lamb in a wolf infested forest. Beyond that, however, no danger exists, or has ever existed. No lives have ever been lost by oil hunters, and but rarely a horse is taken. Guerilla life cannot subsist on this regimen, and a journey from Parkersburg to Burning Springs is as safe as from Philadelphia to Germantown. Even beyond that point, and far on in the rich counties that are now regarded as neutral but dangerous ground, the military authorities are busily engaged in making arrangements for securing rebels and robbers, and in a few weeks Northern capital and enterprise will be permitted to enter and possess these coveted acres.

BURNING SPRINGS AND THEREABOUTS.

Although I began this paper by making Parkersburg the centre of the sketch, and, as it were, the base of operations for my West Virginia campaign, the town itself does not lie in what is geologically called the "oil belt." That is to say that no great oil deposits have been in the country immediately around it.

Yet to the north and the south, and the east and the west, we find many good wells and successful enterprises. Why this plateau should be so barren cannot be accounted for, except as a freak of nature that we must submit to when we wander into these oily mountains and valleys. It should be constantly borne in mind that in dealing with Petroleum we have a science that is entirely new, and that all of our investigations have arrived at no rule by which to determine its nature of origin. I fancy, however, there are very few geologists or men of science among the busy crowds that are seen around Parkersburg. They cling to the Burning Spring as the nucleus of all their speculations. When land is bought the first question is, How far are you from the Burning Spring? When land is sold, the seller is impressed with the belief that he is in the same belt with the Burning Spring. "Every road leads to Rome," and with the gentlemen in Wirt county, every road leads to the Burning Spring. So like a true traveller, when I came to Parkersburg, and found all the world was pushing to Burning Spring, I chartered a homely and comfortable Rosinante and went on my way along the Elizabeth pike, with the rest of oily mankind. Take the map of Virginia and you will find that in a southern direction from Parkersburg in the adjoining county of Wirt, a small creek empties into the Kanawha river, known as Burning Spring creek. There are a number of other streams in the neighborhood, such as Standing Stone run, Nettle run, Reedy run, Two Rifles run, Chestnut run, and others that only make their appearance in the oil company maps. This point, lying in a southerly direction from Oil City, is the heart of the present Virginia oil region, and around it for a radius of fifty miles, embracing the counties of Tyler, Pleasants, Wetzel, Ritchie, Wood, Wirt, Roane and Calhoun, we have what is known as the Western Virginia Oil Territory.

The road was very soft and yielding, and a heavy shower of rain was falling as we rode along the Parkersburg pike. My companion was an old settler, one who had lived there all his life, and a man of much intelligence. His home was on the banks of the Kanawha, a few miles from Burning Spring, and he promised to accompany me to Elizabeth, help me ford the river, and send me on my way rejoicing. After leaving the town we pass into a low rolling country and find, for a few miles, the leaves and fields to be as unostentatious as those in Chester county. Very quickly the scene begins to change. Hills that we city people would gladly call mountains, seemed to rise and swell against each other as though in anger, venting their animosity in numerous small and narrow ravines, through which the falling rain kissed the mountain wrath. We were constantly ascending or descending a hill, and at every turn of the road we came to some unaccountable abyss, over which the moss was growing, and down in whose crevice dark streams of greasy water would arise. Oil men had been here with sticks and divining rods, and wherever there was the odor of gas, or a mere globule upon the water, straightway its value advanced a thousand per cent.

As we approach Elizabeth we cross a very high hill and descend into a plain formed by the Kanawha river. Here we have the first indication that many years ago, when breaking a rock, and endeavoring to sink a salt spring, a stream of greasy water gushed forth, which became ignited and burst into flame, whereupon all the world for twenty miles came to see it, and those who were religious said their prayers, for, according to the Scripture, the world was to be destroyed by fire, and behold nothing was necessary to consummate the Divine decree but the application of a match. However, that generation passed away, and still another generation, until a people came who

cared neither for fire nor Scriptures, and began to offer the farmers large sums for their acres, and to bore for oil. Then the old men told the story of the fire, and, although the site was designated, men have hunted, and bored, and even prayed in vain for the burning stream. In 1860 at least three thousand people were in and around Elizabeth, boring for oil, and endeavoring to develop oil lands. There came a crisis. The price of Petroleum suddenly decreased, until the barrels, as they came from the hands of the cooper, were of more value than the oil that filled them. Two causes led to this. The world had not learned the uses of Petroleum, and the many surface wells threw forth so many barrels of oil, that the supply was larger than the demand, and the market became overstocked. This disheartened capitalists, and lands fell. Then came the war. Virginia seceded, and the line of the Ohio became contested ground. McClellan crossed, but his forces were too busy with the Baltimore and Ohio Railroad to think of protecting the three thousand oil hunters then swarming along the Kanawha. Although there was no organized army of the Confederates in West Virginia, there was nevertheless a body of guerillas who were constantly harrassing the country. The result was that a panic ensued. In a week the whole party left. The derricks stood in the field with the half bored well, the oil gushed up and overspread the ground, the houses were torn down for camp fires, and the whole enterprise perished. It is now rising again under the impetus of the great excitement in Pennsylvania.

Elizabeth is an astonished town to day. The people do not know what all this means. Their lands, that were but recently of no value but for sheep-feeding, are in as great a demand as turkeys on thanksgiving day. You will find, on looking at the map, that

after leaving the Kanawha, at Parkersburg, we touch it again at Elizabeth. There is no bridge over the river, but we managed to ford it, and, taking the road that leads through the Two Rifles run, pushed directly on, leaving the river behind and striking for the headquarters of Burning Spring creek. I could not imagine a more disagreeable day than that on which I made this remarkable journey. The rain was pouring in torrents, a dead, steady, incessant rain, as though Jupiter Pluvius had become weary of this dirty earth, and was determined to give it a thorough drenching. The run crosses and recrosses the road, and as the rain had swollen it beyond all recent precedent, we were compelled to ford it at least twenty times, when another mountain arose before us.

The road wound around the mountain, and as we came to the summit, far below the Kanawha circled its way, until the eye could no longer distinguish it from the clouds. Notwithstanding it was November (and of all days the most Novemberish) there was something ecstatic in the wild freedom of this gorgeous scenery. Go to West Virginia that you may climb the high hills and bow down before the sublimity of Almighty God. I checked the pace of my patient and homely Rosinante, and, thoughtless of the rain, of the journey that lay beyond, and the many miles I had given myself on the map, surrendered my whole soul to the enrapturing scene. Now that I write these lines far away from the Kanawha, and think of the Burning Spring, its mud and rain, and greasy waters, and eager, avaricious, hungry men, in muddy boots--that glimpse of nature rises to the mind and brightens all.

The country has a wild and sterile appearance ; the banks of the river are often steep and perpendicular, while the valleys are generally narrow, and in many

cases there are marshes and swamps running from the base of the hills to the banks of the river. The hills are generally from three to five hundred feet high, often covered with boulders of sandstone rock ; a heavy growth of timber, in almost all cases, covers the hills from base to summit, but which is rapidly disappearing before the woodman's axe. Evidently, nature has been convulsed and in trouble here at some time, and, judging from the appearance of the broken and shivered rocks, the struggle must have been tremendous.

All along the (Kanawha) river and on the banks of its tributary rivers, we find evidences of the great panic that suddenly strangled the enterprises of 1860. Every few rods we see the black and mouldering derrick and the unfinished well in the ground. The few brave men who remained have made princely fortunes —the Rathbones, Camdens and McFarlands being among the oil princes of this new domain. They made their money by buying these lands at low figures, sinking good wells, and disposing of their purchases to the companies recently formed in New York and Philadelphia. Around the Burning Springs there are but few wells throwing up oil, and these are not recently developed, but the remnants of wells that have produced as many as one thousand barrels per day, in their time, the gas sending up the oil in a thick, rushing stream as high as the tree tops, so that no tank could hold it, and it rushed out into the river and covered the stream. The old "Eternal Centre" well is eccentric. It was discovered by one of the Rathbones in 1860, and when struck the finder clapped his hands, and shouted, for he had found, he said, "the eternal centre of the great oil basin." It does not flow in a stream, but every six hours sends forth a few barrels, making a yield of about twenty or twenty-five barrels a day. The other

wells in this vicinity are pumping wells, and some of them reach as high as fifty or a hundred barrels a day. And yet, in justice to those who have spent large sums here, it must be said that when we speak of West Virginia we speak of a business that is in its absolute infancy.

THE LINE OF THE GREAT UPHEAVAL.

Although I confine my remarks to this narrow spot, called the wells of the Burning Spring, it must be remembered that the territory I traversed from Bull creek to Tyler county, and thence to Park creek, embraced the greater part of a hundred miles. There is what the geologists call a belt of oil land running from Tyler county, Virginia, to Charleston, in Kanawha county. Take a map of Virginia and stick a pin at the point marked Middlebourne, in Tyler county. Thence carry the eye in a southwesterly direction until you reach Charleston, in Kanawha county, on the great Kanawha river. We will suppose this belt to be thirty miles in width, and we have the oil territory before us. It embraces nine counties : Tyler, Pleasants, Ritchie, Wood, Wirt, Calhoun, Roane, Jackson, and Kanawha. In all these counties oil has been found. In Wirt county more wells have been struck—and in Tyler county, which seems to be a counterpart of Wirt, the geological features are strongly marked. I did not visit Kanawha or Jackson county, as the country was too unsettled for random travellers ; but in all the other counties I found the same singular geological formation. The hills seem to pitch and toss and tumble as though the Titans had been hurling mountains at each other in some early supernatural war. They have a confused, whimsical look, and by their combinations excite odd and amusing fancies. Yet these strange rocks are followed by the oil-hunters with as much avidity as gold

diggers the beds of California rivers. I do not propose to tempt any criticism upon my geological acquirements by endeavoring to explain these hills or to read the riddles that lie hidden in their coveted caverns. We know that water and fire are the agencies that have revolutionized the surface of the earth ; and that in following up our oil investigations, we have merely to consider the relations of the stratified and unstratified rocks that run along the Alleghenian ridges. Coal, which is a near relation to petroleum, according to many, nothing more than petroleum hardened by some hidden chemistry of nature, is found in that group of secondary rocks which includes the red sand-stone and mountain limestone formations. Petroleum is found in the bituminous measures and the sandstone rocks. The men who work the wells will tell you that there are three sandstone rocks in which oil is found. They bore until they strike the first rock, at a distance of from sixty to a hundred and fifty feet, and find what they call the surface oil. This exhausts rapidly, and in many cases does nothing more than emit gas and salt water, and thin streams of oily water. Some of the most successful wells in Western Virginia were surface wells ; but in Pennsylvania the borers try to reach the third rock. Here, at a depth of from three hundred to a thousand feet, as the formation varies, the large basins of oil are found—the basins which have given Pennsylvania sixty millions of wealth. The ignorance of this fact led many of our early pioneers to abandon in despair their enterprises. They sank a well to a first or second sandstone, and finding a trickling stream of oil, and no more, they abandoned the enterprise poor men. Shrewder managers drove their drills deeper, and gloried in wealth. •

THE GEOLOGY OF PETROLEUM.

This " belt " of oil land lies in what the geologists call the coal measures. It is not independent or exclusive, but reappears in the southwestern counties of Pennsylvania, and again in Ohio along the valley of Muskingum. It is one of many similar deposits or formations. We find it in Canada, in Indiana, Michigan, Tennessee, Kentucky, and New York. It has come forth plentifully in Venango county, Pa. Yet we know that there are oil springs in Russia where the traveller can push his cane into the earth and see it bubble around him, and that at Burmah, India, there is the celebrated Rainanghong oil district with its five hundred wells. Science is busy giving us rules for gathering the oil, and labor and capital are busy showing Science how she is partly right and partly wrong, and not to be depended upon in her petroleum investigations. Now, in comparing results we find that oil is found in the corniferous limestone, a rock composed of fragments of coal and seashells filled with bitumen. Overlying this we have the rock known as the Marcel-lus shale, a kind of hard slate formation. Between these two rocks, the limestone and shale, all the oil reservoirs are found. In Canada, we find these rocks not to be more than one hundred and fifty feet thick, making the oil comparatively surface oil. In New York oil is found in another group of rocks similar in formation, but at least three hundred feet deep. In West Virginia these geological indications are very strongly marked, and I think upon the practical operation of the next three months much of what we call the science of petroleum will depend. The surface indications are more remarkable than in Ohio or Pennsylvania. These tumbled rocks certainly show large crevices beneath, in which oil might distil for ages. We have bitumen and asphaltum, and we have had oil; and so,

if there is any logic in Nature, oil must be here. Yet we find on Bull creek, in the very line of this upheaval, and within a few rods of the Horse Neck well, that borers have found large cavities empty or filled with mud. I saw a forlorn young oil hunter at Bull creek, who, after boring for some weeks with good indications, came to a crevice where his tools were lost. He had not found a bottom to his fissure when I left, although he was bravely determined to fathom it. It is possible that here, as on the Little Kanawha, below Parkersburg, the fissures are occasioned by the drying or shrinking of the rocks.

HUGHES RUN.

Having spoken of Burning Springs, and given you an idea of the great enterprise there existing, it is proper that I should make more particular allusion to other points which are now in the hands of capitalists and which command the attention of buyers and sellers in the East. Next the Burning Springs proper, the most important part of West Virginia seems to be Hughes river. It is a stream about half as wide as the Schuylkill, and so shallow that at most seasons of the year a horse can ford it. Flowing into the Kanawha, and running in a northwesterly direction, it forms a part of the boundary line of Ritchie and Wirt counties, and intersects the Little Kanawha at a point called Newark, some twenty miles from the Burning Springs run. It is in the line of the great upheaval; and there are many interesting geological features in this county. It is evident that in the petroleum age the geological disturbance was very great. Through this line of upheaval the Hughes river forces its way, and around it we find many new and interesting strata which seem to have been thrown up from the very centre of the earth. The rocks of Hughes river seem

to be of a light colored compact flint, of about ten or twelve feet in thickness, beneath which are seen the shale rocks strongly impregnated with bitumen—a rock which is often seen in our coal measures. I do not know that any coal has been found on the Hughes river, nor have any fossils, such as are often seen in the shale rock, been discovered. At the same time, the oil men, whether trusting in their own instincts or the teachings of geologists, have laid violent hold upon these high and rocky banks, and now ask large sums for their possessions. In former years, large quantities of petroleum were taken out of the alluvian bank of the Hughes river by a natural process. The rock was separated, and through the fissure the oil ran for years, saturating the stream. Former settlers, who gathered the oil in small quantities for medicinal and domestic purposes, were in the habit of laying bare this stratum by removing the earth and digging out the oil with hoes, axes, and farming utensils. It has been said that, with the exception of Venango, the oil has flowed here in greater quantities than anywhere else. A number of wells have been sunk, but when I passed through the country the enterprise had not been far enough developed to make Burning Springs and Oil creek in any way dread its rivalry.

BULL CREEK.

Another point in Virginia is known as Bull creek—a stream which runs into the Ohio river some 30 miles above Parkersburg, taking its rise in Wood county and being one of the number of streams which are known as French creek, Cow creek, McElroy creek, and by other names that belong to the classic vocabulary of Virginia. The Horse Neck well, some six or eight miles from the source of the creek, has attained great celebrity, and was, in its day, one of the most

successful enterprises in Virginia. The supply of oil has greatly decreased, I am told, but, at the same time, it is a curiosity, and is always visited by travellers through this region. The country around Bull creek is tame when compared with the vicinity of Burning Springs, and might be regarded in Pennsylvania, or New York as very pleasant farming land. Here, as in Ohio, the capitalist and the artisan are very busy. Wells have been sunk, leases are constantly granted, and as we ride along the quiet, old fashioned turnpike, the tall derrick, with its skeleton pillars and quick busy engine, and swearing teamster, as he toils through the mud with his load of oil, give us, on a small scale, the busy sights of Venango. Further up the Ohio, at Sistersville, we come to what seems to me to be the beginning of the Virginia line of upheaval. In Tyler county, especially around the county-seat, Middlebourne, the evidences of oil are very abundant. This is so near our State that one almost imagines he is riding on Pennsylvania farms and homesteads.

RECAPITULATION.

Out of this speculation and fanfaronade, I can sum up the results of my ten day's journeying thus :

I. West Virginia is but partially developed, and, therefore, all purchases of land are speculative, and not investments.

II. The oil territory that extends from Middlebourne, Tyler county, if the surface indications are borne out, will be the great oil basin of the Continent.

III. That in West Virginia, if capital should fail to find recompense in Petroleum, the abundant mineral indications will repay enterprise and skill.

IV. That with the pacification of the country, the slack-water of Kanawha, the building of a railroad

along the line of the great upheaval, and the erection of mining and manufacturing facilities, West Virginia will become an empire of industry, wealth, and skill, and the valley of the Ohio become as prosperous as the valley of the Merrimac or Delaware.

RAWSON'S RUN, FRENCH AND CROW CREEKS.

On Rawson's run there are several wells which give a good yield, and those which are being bored have a very fine "show" of oil. The American Oil Company own several wells on this creek, which is a feeder of Horse Neck. In October last, Messrs. Tack & Brasher, of Philadelphia, struck a well on this stream which flowed 800 barrels of oil in a single day. It has not however averaged over 120 a day since. This well is shallow, being only 200 feet deep. The same firm have another well, from this not very far distant, which yields 300 barrels a day. While only about half a dozen wells were in operation here a few months ago, twice that number have since been sunk.

On French creek, which empties into the Ohio, nearly opposite Newport and Newell's run, about twelve miles above Marietta, and about twenty miles above Parkersburg, several promising wells have been bored; amongst them may be mentioned the one owned by Mr. Batfield which gives fine promise of success. Certain lands have already been leased by Mr. Tisdall to the French Creek Oil Company, and it is stated to be the intention of that company to open eight wells thereon.

The lands upon Crow creek, which empties into the Ohio, about ten miles above Marietta, have been purchased by Eastern capitalists. Messrs. Jackson & Pedro own a well on this creek which is five hundred and eighty feet deep and throws a heavy stream of

water and gas. It is being bored deeper, and when completed, the results will no doubt be very satisfactory.

CROW RUN, DUCK AND BULL CREEKS.

On Crow run, which empties into the Little Muskingum, is the McFarland well, over seven hundred feet deep; and about eight miles north easterly from Marietta, the Newton well, which is owned by the Bergen Oil Company, and yields about twenty barrels per day, after having produced altogether twenty thousand barrels already. The Virginia and Ohio Petroleum Mining Company have, also, a paying well on Crow run, and the whole of Crow run is regarded by experienced judges to be very valuable for mining purposes.

About a mile above Marietta, Duck creek empties into the Ohio river. Four paying wells are on the borders of this stream, one of which, the Reckard well, is over seven hundred feet deep, promising to be a well of an enduring nature. The territory on Duck run is regarded, altogether, as a very fine oil region, and land commands a pretty high figure accordingly. On Duck creek is also the famous Dutton well, which has already yielded over seventy thousand barrels, and the Pittsburgh Oil Company have a fine well on the farm of Mr. Smithson, which spouted a stream of oil as high as the tree tops on being struck. The Erie Company, as also the Duck Creek Company of Pittsburgh are operating on this creek.

Bull creek is one of the promising feeders of the Ohio, although the territory along the creek has as yet but little been worked. Professor Roberts, of Philadelphia, says of a tract of land, about two miles below the mouth of Bull creek: "I have within the present year made three tours of examination in the oil regions

of Ohio and West Virginia, and in no place have I seen surface evidences more favorable for Petroleum than is to be seen within the limits of this tract. The contiguous topographical features of the vicinity, together with its geological characteristics, are in every particular the same as those shown at Cow run and Duck creek, in Ohio, on Bull creek, Cow creek, *Horse Neck*, Petroleum and Burning Springs, in Western Virginia, all of which are oil producing localities. I have been on this farm three different times, and once was fortunate in being there when the water in Carpenter's run and its tributaries was very low, forming only shallow pools in places ; on most of these oil was visible on the surface, and on some of them it formed a thick scum. On McDougal's and Sugar Camp run are well marked lines of fissures in the rocks, presenting good points for boring ; some of them show both oil and gas, which are considered good surface evidences, and offering the strongest inducements for exploration.

On the main stream of Carpenter's run, even down near to its confluence with the Ohio, I found several places where the oil would rise to the surface of the water by forcing a cane into the sand and gravel forming the bed of the stream. Where the road leading from the county road to the farm house crosses Carpenter's run by bridge, there is a pool of water some three feet deep, and some few rods in length, where the gas continues to bubble up and throw off oil. I watched it particularly, while standing on the bridge, for half an hour or more, and I discovered that these bubbles formed a line across the stream in a diagonal direction to its course, showing evidently, the direct line of a fissure below."

Mr. L. D. Williams, Geologist, says : " And taking into account the evidence which everywhere exists along the Ohio river for a great distance above and below the mouth of the much talked of crossing the

axis of the upheaval, near the mouth of Bull creek, I am strongly of the opinion that quite as promising territory may be found along many other tributaries of the Ohio. I am very favorably impressed with the country about Newport, Ohio, and St. Mary's, Va. Much oil is likely to be found in Pleasants county, Va., and Washington county, Ohio."

HORSE NECK.

On Horse Neck is situated the big well, known as the Gilfillan well. It is about two hundred and fifty feet deep, has been worked for several months and has yielded from seventy-five to five hundred barrels per day. The Stone well, on the same stream, has been pumping from twenty-five to thirty barrels a day, and is improving. The Greer well, also on this creek, remained idle for some time, but is now yielding thirty barrels a day. The Shrewsbury well is one of the best producing in this vicinity. The Delleker well is also remunerative. The Tack wells, which have long been famous, are still producing their usual quantity of oil, and are reputed to be the leading producing wells in the Horse Neck region. The Bull Creek Company own several of the wells on this creek. New derricks meet one throughout the entire route from Bull creek to Horse Neck, and in the vicinity of Horse Neck prices have already partaken of the upward tendency of the Pennsylvania oil region.

AROUND HUGHES RIVER.

On the north bank of Hughes river, abandoned oil pits cover an area of several acres which, not long ago, have been sold to a Pennsylvania Company, while three or four other companies are sinking tubes and carry on operations. The country south of Hughes

river is peculiarly rich in oil and minerals, and all indications point to that territory as abounding in wealth. Wherever wells have been bored, oil of a superior quality has been obtained. The geological indications between Hughes river and the Kanawha being the same as those in the most productive oil territory, there cannot be any doubt that some fine wells will be developed. On a branch of McFarland run is the rich vein of mineral bitumen, resembling the famous Albert coal of Nova Scotia. It is called the vertical coal seam, and is one of the most remarkable deposits of bitumen on the continent. At Burning Springs there was produced in the year 1861 four millions of gallons of oil, and in 1862 three millions two hundred thousand gallons were shipped from there, and yet, the territory where this has been produced does not exceed one mile square.

RITCHIE COUNTY.

Ritchie county is destined to be the centre of the oil producing territory in West Virginia. Although oil wells have not been as extensively developed in this county as they have been in Wood and Wirt counties, there are certain unmistakable signs of the great richness of the region. Oil is found oozing from the ground in every part of the county, and the great vein of crystallized *Petroleum* recently found here, indicates how abundant must be the sources of supply beneath the surface of the earth. This vein was described by Professor Lesley in a paper read before the American Philosophical Society in Philadelphia, but its statements were so remarkable that many scientific men distrusted the accuracy of the facts which had been communicated to Professor Lesley. But few additional notices of the vein have been made public; the proprietors of the property not having published

anything on the subject, their object being apparently to develope the vein extensively themselves, and with that view they have been constructing a railroad fourteen miles long, and now nearly completed, to bring the products to market.

We have availed of all the information that we have been able to obtain in regard to this singular mineral—so important in its bearing upon the character of the oil territory of West Virginia—and we give it now in full, even at the risk of some repetition, to show that the substantial facts concerning the vein are indisputable.

CRYSTALLIZED PETROLEUM.

Sherwood's guide book of West Virginia, gives the following description of this vein :

" Petroleum coal, (as it is called,) was recently discovered about eight miles from this station, (Cairo) by Mr. Frederick Lemmon, in a small ravine between two steep hills (some three hundred feet high). The vein is about four and a half feet wide, and lays in a vertical position, extending to near the top of each of these hills. The oil is extracted directly from the coal, which so far has proven to be the richest coal (in oil) ever discovered—yielding one hundred and sixty gallons of crude oil of very superior quality, to one ton. Eminent geologists have given their opinion that this coal is the Petroleum oil (called Rock oil) crystallized, and that at the same depth in the earth there is a vast reservoir of oil in its pure state."

Dr. Gesner, in his "Treatise on Petroleum oils," gives the following description of this mineral :

" A vein of bitumen has recently been discovered near Cairo, Parkersburgh, Virginia. It is represented as a perpendicular mass, jutting out from the side

of a hill two hundred and ninety feet. The strata of the hill are nearly horizontal, and they are cut at right angles by the continuous vein of the bituminous mineral, which is four feet eight inches in thickness. The position of the vein has been ascertained by the proprietors, who have sunk a shaft upon the line of the outcrop. A sensible description represents that it appears the hill has been split, a perpendicular chasm opened, and afterwards filled with asphaltum in a liquid state, and which has since hardened into a compact material. Coal never occurs in this manner, but is always interstratified with its associate sandstones, shales and fire clays. In all its geological relations and character, the Cairo deposit is like the asphaltum of Albert county, New Brunswick. The bitumen veins of Cuba have similar deposits in the earth. The Cairo asphalt will no doubt be found valuable for the manufacture of oils. The samples received from this new mine are bright, glossy, and brittle. They are rich in oil, and yield at the rate of one hundred and seventy gallons per ton. This bitumen is evidently Petroleum, which has at some remote period issued from the earth and been hardened by evaporation, and exposure to the oxygen of the atmosphere. The oil springs frequently occur in the immediate vicinity of the coal."

EXTRACT FROM A REPORT OF CHARLES S. RICHARDSON, CIVIL AND MINING ENGINEER, INCIDENTALLY REFERRING TO THE RITCHIE PETROLEUM VEIN.

In the adjoining estate has been discovered one of the most extraordinary mineral deposits ever known in this country, a deposit of so strange and unusual a character, that if its presence was only once generally known, it would attract the attention of scientific men from all parts of the Union. This is nothing more

or less than a perfectly true "Lode" running nearly east and west, filled in with solid crystallized Petroleum or mineral oil, not coal, for it will melt in a ladle like pitch, neither is it asphaltum, for its fracture and lustre differs materially from that substance. The lode is 4 feet 6 inches wide, and has a vertical dip. There is no admixture of any other earthy substance with the mineral as far as the excavations have been extended. It appears to be divided into two parts by an irregular vertical joint, one portion being granulated, and the other fibrous or somewhat flaky. The walls are regular, smooth and well defined in contrast with those on the north side.

Shaft pits have been sunk at intervals in both directions for over a mile across the mountains on the back of the lode, by which its course has been found to be regular.

A trial shaft was next sunk on its dip to the depth of 37 feet; and there appeared to be no diminution in the quantity or quality of the mineral.

From an analysis made by a Philadelphia chemist, I gather the following particulars of the properties of this mineral: that it produces 169 gallons of crude oil to the ton, which on refining only loses fifteen per cent; that is to say 100 gallons of crude produces 85 gallons of burning oil, showing that as a material for the production of hydro carbon, it is of very great value.

PROFESSOR LESLEY'S REPORT.

The following report is taken from the printed proceedings of the American Philosophical Society:

Professor J. P. Lesley communicated a notice of a remarkable coal mine or Asphalt vein, cutting the horizontal coal measures of Ritchie county, Western Virginia.

Mr. Lesley said, that through the kindness of R. H. Gratz, Esq., of Philadelphia, a descriptive letter and a map had been submitted to him, which exhibited geological facts of more than ordinary interest to those who are studying the origin of the rock oil deposits of the West.

The curious points of the case require careful investigation; but there seems to be no good reason to doubt the essential correctness of the statement.

The coal-beds of West Virginia pass horizontally through the prong-like ridges from valley to valley. Some of these ridges run as narrow on top and as regular as railroad embankments, for three or four miles, and in nearly straight lines, between equally straight vales terminating bowl-shaped against some cross ridge.

It is across such vales and dividing ridges, that the Asphaltum vein of Ritchie county makes a straight course, "two thousand three hundred and twenty-three feet long, as at first measured, but since then traced in both directions still further, so that now it is known to extend more than two-thirds of a mile." Explorations beyond this line have failed to find it. Its outcrop, four feet ten inches thick, was discovered crossing a ravine fifty feet wide at the bottom, and rising on each side with slopes of nearly forty-five degrees. On one of these hillsides at a height of ninety feet, the outcrop showed the same thickness, but at a height of one hundred and eighty-five feet, it was found to be but two feet six inches thick. It is not certain that this diminution is in a vertical direction; it may be lateral; for the slope between the ninety and the hundred and eighty-five feet levels is more gradual, especially upon the western side.

In the bottom of the ravine, a vertical shaft was sunk to a depth of thirty-four feet upon the vein, which continued uniformly four feet ten inches thick, the

asphaltum being filled in pure and clear, without the least admixture of earthy or foreign ingredients, between the smooth and almost perfectly vertical walls of yellowish-greenish sandstone, lying in horizontal layers, through which this gash or fault was once no doubt an open fissure, communicating with some reservoir of coal oil which still, it may be, lies beneath it undisturbed. The most interesting part of the phenomenon for structural geologists is this gash.

The substance which fills this gash-fault in the coal measures of Northwestern Virginia, resembles the glossiest, fattest caking coals, and has a decidedly prismatic structure ; breaks up into pencils, with flat, lustrous faces and sharp edges, but the faces not set at any fixed angles to each other, so that the effect upon the eye is rather that of a fibrous than of a prismatic structure. At the same time there is not the slightest appearance of layers, but the aspect of complete uniformity or homogeneity. Pieces are taken out, it seems, a foot in diameter ; and that portion of one of these pieces which I have, shows a plain face on one side, as if it had encountered one of the walls, and is covered with a delicate film of a dead black substance like charcoal dust, which is probably the dust of the vein substance itself.

Pieces lying at the surface of the ground are said to yield as much oil as specimens taken out six or eight feet down. By the ordinary dry distillation the substance is reported to yield as much oil as the Albert coal. By a different process, the first and only trial, at which six hundred pounds in one charge was used forty-four and a half gallons of superior oil was obtained. Retorts are now upon the ground.

By an assay made by Mr. B. S. Lyman of Philadelphia, (the amount of hydro-carbon soluble in benzole being about one-half of the whole) the volatile matter

(mean of two assays) was 47.11 per cent, coke (52.71, 53.07) 52.89, ash (1.65, 1.81) 1.73.

There seems to be no escape from the conclusion that the substance filling this vertical vein is a product of the gradual oxidation of coal oil once filling the open fissure. It is not impossible therefore that the lower regions of the fissure are still filled with liquid oil; and that we may see in this instance an illustration of the condition of things far beneath the surface of the coal oil regions of Western Pennsylvania and Eastern Ohio.

The vast quantities of oil delivered by the flowing, the blowing and the spouting wells require fissures of this kind, either never opened up clear to the surface, or else once opened and now reclosed, or else filled in with detritus. The different depths at which closely neighboring wells begin to spout or to flow, oblige us to imagine similar fissures at oblique angles.

If Sterry Hunt's hypothesis be accepted, that the corniferous limestone is the mother rock of the oil, such fissures become still more needful to bring the oil to the surface, from the vast depths at which the Corniferous Limestone underlies the true coal measures.

GEOLOGICAL AND MINERALOGICAL REPORT OF PROFESSOR W. F. ROBERTS.

McFarland's run is a noted locality in the great oil formation of West Virginia. A vertical crevice filled with crystallized or solidified petroleum in a direct line is found crossing the deep cut gorges of small streams and rising to the summits of the ridges bounding them.

In the month of June last I made a special visit to this part of the country for the express purpose of making a full and particular examination of this phenomenon, if I may so term it, in geology. I traveled

from Cairo station on the Parkersburg branch of the Baltimore and Ohio railroad over a road then in process of grading by the Ritchie Coal Oil Company for a branch railroad to connect their property containing this solidified petroleum deposit with the main road, and during this journey, I could not detect anything remarkable or different in the general geological structure of the country to that shown in some of the other oil producing sections in the West Virginia "oil belts" with the exception of an opening made on the line of the road on the Ritchie Coal Oil Company lands near McFarland's run, where there is a vein of a peculiar substance, resembling somewhat some of the most glossy kinds of bituminous coal. Having secured specimens, I continued round the point of the hill, and entered a deep cut gorge formed by a small run, a branch of McFarland's, and at about half the distance from the head of the run, I reached a shaft sunk upon the line of a fissure, or crevice in the strata, in this peculiar kind of substance, of the same quality and characteristics, of the specimen taken from the place above referred to. This crevice is a vertical one, four feet four inches wide, and the strata adjoining it on both sides is horizontal, a common micaceous sand stone, in their plys of a yellowish green color, of the carboniferous formation.

The shaft I was informed was sunk thirty-four feet, and the crevice continued of the same width downward. It was perfectly filled with solidified Petroleum. The course of the dyke or opening in the horizontal coal strata run in a course S. $75\frac{1}{2}$ W. and to N. $75\frac{1}{2}$ E. which I traced in both directions. I traced the openings which had been made in the line of this crevice up the steep sided ridges and over their summits, and I found from the specimens visible at the several shafts that the solidified or crystallized Petroleum rose to the surface, or nearly so, in all places. The west hill

bounding the ravine where the dyke crossed over, I judged to be about three hundred feet above the level of the ravine where the deep pit was sunk. The east hill side is about two hundred feet above the ravine. Developments of shafting have been made proving the continuation of this Petroleum filled crevice in solidified form more than one mile in a direct line, and bounded by a flat or horizontal formation of shales and sandstones of the middle carboniferous series, similar in all respects to other ridges in oil producing sections of West Virginia. The walls of the crevice are perfectly smooth and regular and exceedingly well defined.

The crystallized Petroleum has a fibrous structure. It is very glossy in appearance, of the color of the purest specimens of richest and fattest bituminous gas coal. It melts under heat readily and runs like pitch. This peculiar mineral has been wrongly called "Asphaltum." Its fracture, lustre, and general appearance are altogether foreign to the Albert coal, or to any other mineral of that class. By experiments made upon this crystallized Petroleum it has yielded from one hundred and forty to one hundred and sixty-nine gallons of oil to the ton.

Developments will prove the continuation of the crevice filled with the same material—the crystallized Petroleum—into and through the properties I am reporting upon, and in consequence of its embracing within their boundary lines two deep cut vallies and high ridges intervening, an immense quantity can be mined above water level, and one cannot put an estimate too high upon this property, containing as it does, this very valuable mineral substance.

How deep this solidified material may continue down beneath the level of the vallies is not determined. The crevice may get much wider and still be filled with this solid Petroleum. One thing is how-

ever certain, that it has its source from some immense subterranean lake or large opening in the strata of the lower measures of liquid Petroleum. The numerous gas and oil springs closely contiguous and ranging with this dyke show that there are beneath the surface large cavities filled with oil.

At the junction of the streams which meet in the Southern part of this tract is excellent boring territory, room enough for a large number of oil wells. The geological structure of the strata shows great disturbance underneath the surface and here may be seen the pure oil oozing out from the joints of the rocks, and gas springs bubbling up on the surface of the water throwing off oil in rainbow colored tints. The nature of the formation, the geological structure of the strata and the contour of the surface, as well as other indications, show that this tract of land is located in an exceedingly rich Petroleum section of country, where proper developments should be prosecuted without delay. One thing more may with propriety be mentioned, that this solidified Petroleum in all places where it has been shafted upon is free from any deleterious foreign substance. It is as pure as oil generally is found in the best oil producing localities of West Virginia.

REPORT OF NELSON BEALL, ESQ.

The extensive deposit of mineral bitumen in West Virginia is situated in Ritchie county, between the North and South forks of Hughes river, about eight miles in a direct line from Cairo station on the Northwest Virginia Railroad, thirty-one miles east of Parkersburg and three hundred and forty-eight miles by rail from Baltimore. When the mineral was first discovered, samples were sent to the Eastern cities for chemical analysis to determine its character and

quality, the results of which were highly favorable. To approximate as to the quantity of the deposit, an experienced miner was sent to explore the extent of the vein, when it was ascertained it could be traced in a straight line N. 72° W. at a few feet below the surface, about four thousand five hundred feet horizontally, rising from the lowest point of the ravine where it was first opened, westerly three hundred and ninety-five feet to the top of the hill downwards in that direction, and also eastwardly over the point of the ridge one hundred and eighty-four feet elevation. The vein lies in a precisely vertical position between a horizontal soft sandstone rock. Its width at the bottom is four feet and eight inches, whilst at an elevation of about one hundred and sixty feet on the east ridge it is only about three feet wide, thus indicating the probability that it gradually widens as it goes downwards. The miner proceeded to sink a shaft in the vein, carrying it down thirty-four feet below the lowest point of the ravine when a spring of mineral water was struck, and further operations suspended as being unnecessary. There was no evidence of a limit to its depth or the slightest indication of any stratification appearing to show that it was not a solid mass of one kind of material. A superior quality of oil is gathered from the surface of the water of this spring, when during the dry seasons of the year, it collects in standing pools in the valley. A sample of this oil was sent to the eminent chemist, Dr. T. Ogden Doremus, of New York. The presence of this Petroleum would seem to establish the truth of the theory that the vein itself is crystallized Petroleum, and that its original source of supply still exists in a liquid form in a reservoir of great extent and at a vast depth below the surface of the earth. More than two hundred thousand tons of this mineral can be mined above water level, at a cost not exceeding one dollar per ton.

on a production of one hundred tons per day. An additional one dollar per ton will place it in the cars of the Baltimore and Ohio Railroad at Cairo whence it can be sent to Baltimore, or to Parkersburg on the Ohio river.

Thirty-two barrels of this mineral were sent North last spring, and nearly all of it was retorted, a large portion being put through on a commercial scale in the City of Brooklyn, and resulted as follows :

Yield of one ton.

| | |
|---|----------------|
| Illuminating Gas, 7000 feet @ \$2.00..... | \$14 00 |
| 140 Gallons Oil, @ 60..... | 84 00 |
| 17 Bushels Coke, @ 12..... | 2 04 |
| Whole product in value from one ton, | <hr/> \$100.04 |

The above results were obtained through an improved process of using superheated steam for the distillation of the oil, by which method all the incondensable gases can be saved and utilized for purposes of illumination in towns and cities. The illuminating power of the gas according to the experiments by Professor Bogart at the Metropolitan Gas Works, was 47 candle illuminating power, the standard gas of that company being 16 candles. The specific gravity of the oil was $29\frac{1}{2}^{\circ}$, and its value was computed to be one-third more than ordinary Petroleum. It yielded in refining the unusually large quantity of thirty-one pounds paraffine to the ton of bitumen.

The analysis of Professor R. Ogden Doremus as reported to me resulted as follows :

100 parts mineral dried at 212° F.

| | |
|---------------|--------------|
| Ash..... | 2.15 |
| Hydrogen..... | 8 45 |
| Carbon..... | 75.96 |
| Oxygen..... | 12.75 |
| Nitrogen..... | 69 |
| | <hr/> 100.00 |

The foregoing description of the vein can be relied upon as being as near the facts as one can arrive at. I give them from my own personal knowledge, having been originally the pioneer in the exploration of this remarkable geological phenomenon.

EXAMINATIONS AND DISCOVERIES.

We started from Parkersburg and traveled the course of the Little Kanawha, from its mouth upwards, noting all its geological features the entire distance, making sketches of every prominent object, and closely examining all mineralogical changes in the rock formation. At Glenville, eighty miles up the river, or seventy miles by direct route, we struck off to the south, taking the Ripley turnpike, and in three miles came to Cedar Creek, five miles from its entrance into the river. We now followed this stream to its source, which is about twenty-five miles. All along this valley we found most positive evidences of springs. Four miles above here we came to Big Bull run and Butcher's run. At Bush run, the county line crosses the creek. At Myer's run there are quite a number of oil indications, and at certain seasons gas may be found in many places. Between the country line and this place there appears to be a depression in the coal measures, for the seams take what appears to me a rapid rise to the east.

Not having time to investigate the matter, we pass onward to Slab Camp run. For several miles now we find excellent well-boring sites, until we approach the head waters of the creek, where the surface indications diminish very rapidly. Our course is up the middle fork and Perkins' run; then crossing the ridge we go down "Scouts Path run," one of the lateral branches of a branch of Steer creek. Descending this, we come to a promising piece of land, at the

point of intersection of several small ravines. Here, some day, will be found a good oil location. The weather was so bad and the day waning fast, I had not time to examine it with care, so decided to defer it till another time. We now descend the main branch and cross over by a low gap, at a settler's house by the name of Jonathan Young, the dividing ridge, and descend by the way of Otter creek, to the valley of the Elk.

UP RUSH CREEK.

Up the creek, seven hundred yards from its mouth, and near the house of a Mr. Thomson, is a strong oil spring, with gas issuing intermittently. At the house a well has been sunk for domestic purposes, but in summer when the streams become low, the water is so "greasy," as the women call it, that it renders it thereby, totally unfit for use. Due north from this spot on the other side of the hill, in a branch of the creek, the gases again find vent and throw up oil in the same manner, as in the creek in front of the house. Extending our search up Rush creek, on the same course of deposit, indications of oil are numerous. At the junction of the branches, on the same bottom, are two or three gas springs, each throwing up bubbles of oil at intervals, and I think when the creek bottom is thoroughly explored, oil will be found in many other places.

SUGAR AND GRANNIES CREEKS.

In the immediate vicinity of Otter creek, and parallel therewith, having their head branches all running up into the main body of the land, are Sycamore creek, Sugar or Sheet creek, and Rockcamp Creek. In all of these gas and oil springs are abundant. In one of them there is such a continual emission of gas that it vies with the famous Burning Spring itself. We found not only oil on the surface of the pools, but the

very earth is saturated with it, giving a soapyiferous feel to the clay along the bank of the stream in the vicinity of the springs. This district is bound to become one of great interest in a very short time, and I look forward with anxiety to the day when its first oil developments commence. Passing up the river toward Sutton, the late county seat of Braxton, is Grannies creek. I had no time to examine much of this creek, but was informed that several very strong gas springs have been found. The next creek is at the upper end of the town, called the Old Woman's creek, and through which the Gauley Bridge and Weston turnpike road passes. Here several coal banks have been opened, and very good indications for oil may be found. I have no doubt many wells will be put down all along this valley, and some of them prove very productive.

BULLTOWN.

We now make our way upwards towards Bulltown, distant seventeen miles, and pass through very promising locations for oil wells. Gas springs abound, and so strong is the pressure at times in some of them, that it creates a noise under ground, the people say, resembling the rumbling sound of a waggon over a rough country road. This can easily be accounted for. When the summer season sets in, the creeks and branches become dry, and the fissures and joints of the rocks which in winter are filled with water, become drained and form vacuities ; the noise of the gas as it bubbles up through the water in the lower depths of these fissures produces an echo, resounding through these cavernous spaces ; hence the rumbling sound spoken of. A few winters ago, an outburst of gas, very singular in its results, happened in the river while it was frozen over. An air hole had been notice-

ed in the ice for some time, but one morning a large column of water, mud, coal, shale, and oil was thrown up several feet into the air, and covered the surrounding sheet of ice for yards. This spot was about opposite, and thus in a line with the Otter Creek springs, and no doubt belongs to the same group of cleavages.

SALT LICK CREEK.

The name given for this creek, like many others, arises from the haunts of the deer. In the olden times, and in fact at the present day, what few are left in this section resort to this place to lick the salt as it flows from the springs. It also was a favorite spot for the Indians, who came many miles distant to obtain salt.

The springs throw up a brine so strong, that salt can be easily procured in the common kettles, which was the primitive mode of obtaining it. Since the establishment of the Bull-town salt-works the forest salt-pans of the Indians and hunters have, like them, vanished. We crossed this creek on our road, and staid awhile at the house of one of the villagers. A heavy freshet prevailing at the time prevented my making any extensive examination, but I saw sufficient to convince me that there must be very great deposits of oil here. We obtained from the residents a good deal of valuable information, and their testimony confirms that given us by those living on the other side of the mountains. All say gas springs are numerous here, and, if all that we hear is true, the place should be called Gas creek. No doubt exists of there being an excellent prospect in view. This creek falls into the little Kanawha, near the mouth of Old Oil creek, which is on the opposite side of the river.

GRASS RUN.

This lies between Cedar creek and Steer creek. I did not visit this stream ; but from the great inquiry for oil lands near its entrance into the river, I am led to think something of value has been found. I infer this much from the fact that the Burning Spring men are trying every means in their power to induce the landowners to grant leases. I met several of them at De Kalb, which is just opposite the creek, and others at Elizabeth and Parkersburg, going up. There is a complete tide of speculators setting in this way, and before another three months I should not be surprised if every available tract of land is sold or secured under lease.

COWPENS RUN AND DUCK RUN.

If I were to judge from the geological and general appearance of the land at Sliding hill and Longshoal runs, which lie on the opposite side of the river, they must contain some excellent boring ground. The hills are much denuded, heavy shale beds occur along the river side. There is a great subsidence in this part of the valley ; great slides have taken place, and for a distance of several miles the country appears to have been much disturbed. I look upon this as a good indication, and think, upon a close examination, there will be springs found here equally as valuable as those in Steer creek.

STEER CREEK.

The most attractive location in this part of the country next to Burning Spring run, is Steer creek. There are two noted gas springs on it, which have drawn the attention of many persons for a long time past. We were

informed by Mr. Karnes, who was the first discoverer of the Burning Spring wells, and one of the most successful operators there, that the "show" in Steer creek equals anything ever found in West Virginia. The frequency of visitors, and the demand for leases, have so inflated the ideas of the residents, that they are demanding the most fabulous prices for their land. I have no hesitation, however, in saying that I believe in the numerous branches of this creek, which ramify in every direction along its course, many gas springs will be found to exist, and that there will be very little difficulty in finding them after the chain is once set in motion. Myself and friends saw quite sufficient to form conclusions, which from these observations, and from years of familiarity with the region round about, may be summed up in a few words, viz: That from external appearance, Braxton county appears to be about the great centre of the oil region of Virginia.

AROUND MARIETTA.

One of the localities where Petroleum is found in large deposits, is about thirteen miles from Marietta on the Virginia side of the Ohio river. With a view to examine this wonder of nature, a party of four of us, on a beautiful October morning, embarked on board a steamboat, and passed seven miles up the Ohio. The magnificent forests on either side of the river, were draped in their gorgeous autumnal robes. The stupendous hills, abutting directly upon the river bank, or seen in the distance behind the broad, beautiful intervals, covered with their luxuriant crops presented every variety of configuration—some deep and precipitous, others, by easy gradation, reaching their lofty altitudes.

Arriving at the mouth of Bull Creek, so called, we

disembarked, and took passage, in a rough country wagon, dignified with the name of "Express." Passing over one of the most execrable roads—up and down tremendous hills—through deep ravines, and over rickety bridges, we slowly made our way. At the end of six miles, however, we found ourselves among the oil wells, at a place called Horse Neck run. Within one of Nature's grandest amphitheatres of hills, in a spot wild and majestic, yet beautiful, with no dwellings made by human hands, with the exception of a few extemporized shanties, are about forty oil wells, some in process of being bored, and others complete and in full operation.

I had the good fortune of an introduction to Mr. Tack, a highly intelligent gentleman of Philadelphia, who is largely interested in these works, and from him had much valuable practical information. Oil wells are at depths varying from one hundred to eight hundred feet, and the deepest are as apt to raise oil to the surface as the shallowest, in consequence of the greater compression of the gas (carburetted hydrogen) at the greatest depth. The wells we visited averaged something more than 160 feet. Mr. Tack states that while they yielded as well as they now do, he shall continue to work them; but if they fail, he shall go to the depth of 500 or 800 feet, with full assurance that he will find still more ample deposits. One class of wells are called flowing wells, where the oil is forced up by the power of the gas alone, without the aid of machinery; but in a majority of instances it is brought up by means of pumps worked by steam. The drilling also is done by steam power.

The yield of the wells varies greatly from 10 to 500 or 800 and in some instances more than one 1,000 barrels a day. In September last, one of Mr. Tack's wells produced 600 barrels daily. Since then it has yielded less liberally, but is still doing well. Ten

barrels a day will pay all expenses, and leave a fair profit. In some instances the oil comes up pure, and in others mixed with water, but the specific gravity of the two substances differing so greatly, a separation very soon takes place. The oil is pumped into vats holding 1,200 barrels ; and I observed, in some instances, while the pump was throwing mixed oil and water into the top of the vat, at the bottom was a stop-cock, through which was running pure limpid water.

Prof. Evans, an intelligent observer and writer on this subject, describes a class of wells as intermittent, which, as often as they are exhausted, replenish themselves, and with remarkable regularity of time. The finding of one of these, he says, may be regarded as a certain sign that there are numbers of oil cavities near together in the same locality. The same gentleman mentions an expedient resorted to when the spontaneous flow of the oil becomes slight, and that is to stop up the orifice of the well, till another "head of gas," as it is called, accumulates. There is danger, however, if the stoppage is continued too long, that the gas will burst out somewhere else, and perhaps find its way into a neighbor's well, for such fantastic tricks may this subtle agent play in the subterranean regions.

THE GUYANDOTTE VALLEY.

Our description of the wealth and resources of Western Virginia would indeed be incomplete did it not include the important tract lying beyond the Great Kanawha. Here is a territory of about thirteen hundred square miles, shut in as it were by the Ohio and the Great Kanawha on the north, the latter river and the Allegheny mountains on the east, the Alleghenies and the Sandy on the south, the Sandy and Ohio

rivers on the west. It comprises the counties of Wayne, Cabell, and parts of Mason and Putnam. It is singularly well provided with water communication, as will be seen by examining the map. On three sides are the rivers Ohio, Great Kanawha, and Sandy, and through the centre flows the Guyandotte, with its numerous tributaries. The geologist, in contemplating the general formation of the region, would say at once that it was peculiarly promising for mineral wealth. Here the bottom lands of the Ohio are abruptly broken by the upheaval of the Alleghenies and a spur of hills which strikes off to the westward, and which forms with the first named mountains an extensive exposure of the mineral yielding strata, and also an immense dam, as it were, to receive and hold the drainings of the vast coal measures above.— We should therefore look in this great natural pocket with the most sanguine expectations of finding abundant supplies of petroleum. The value of this territory, however, is by no means limited to its mineral capacities.

For Agricultural Purposes it is scarcely second, all things considered, to any other tract of equal extent in the State. The soil is not only fertile, and especially so on the river bottoms, but its unsurpassed convenience to the markets of the west and of the world in fact, by means of the rivers that border it, gives it unusual advantages. It is well watered, and furnished with a heavy growth of forests. Professor Buchmann, an eminent English geologist and naturalist, who was sent out to make a scientific survey of the mineral regions of Pennsylvania and West Virginia, says of this tract:

“ I was astonished at the magnificence of the forests. There are invaluable timber trees, not scattered singly at large distances, but the whole masses cover the coal elevations in a position from which the tim-

ber can be as readily brought to market as the coal. From this growth of forest trees it would naturally be concluded that the land must itself be good. The truth of this was amply proved to me by the luxuriance of the corn crops which I found growing in the clearings. The crops of wheat, flour, tobacco, and potatoes, were also good." The hills afford fine pastures, and the country generally is admirably adapted to wool growing, and the raising of all kinds of stock. The climate is mild and healthy, and stock growers have to cut but little if any hay. Thousands of cattle and sheep are raised in this section entirely without hay.

The timber consists principally of white oak, poplar or white wood (which is used as a substitute for pine) and black walnut. There is also a good share of other trees, such as sugar maple, buckeye, hickory, magnolia, tulip, poplar, and a great abundance of paw-paw. Peaches and other fruits flourish finely. The soil is rather clayey than sandy, owing to the abundance of decomposing shale, and is thus adapted to retain its fertility. The formation, however, is in general sandstone.

Indications of Petroleum.—The geographical position and geological formation of this territory are eminently favorable for oil, being identical with locations that yield in great abundance. The surface indications are numerous, the oil showing itself in the creeks, and gas being emitted in various places, which when ignited will burn for days. The oleaginous character of the Cannel coal found in the vicinity, and of the strata between the coal seams affords still further evidence. Prof. Locke, in his geological report describing a vein of this shale says; "It is so soft as to be rather a hard *unctuous* clay than a rock." But.

even if ocular proofs and indications of oil were wanting, its existence could be inferred with reasonable certainty, from the fact that the great oil belt, which according to the unanimous statements of all scientific men and experts, runs in a southwesterly direction from the celebrated oil regions of Pennsylvania, cuts directly through this territory. Thus there are on one side the Burning Springs of the Great and Little Kanawhas, and upon the other, the springs of the Big Sandy. That oil would be found therefore in this intermediate region where the great oil channel has been upheaved and dammed up by the mountains, might have been easily predicted beforehand. Experiments however have demonstrated the fact. In 1861 a company was formed, and sank two wells, one near the Guyandotte Falls, and the other near Salt Rock Dam in Cabell County. These wells had been put down to the depth of about 60 feet when the present rebellion commenced, and all further operations were thereby prevented. Oil, however, was discovered in small quantities, and the superintendent of the boring, a man who had had large experience in the business, declared that success was certain if the work could be continued. Doubtless as soon as the war ends, the rich resources of this region will be speedily developed. In sinking the salt wells, in this region, about fifty years ago, gas and petroleum were found in such quantities as to interfere seriously with the manufacture of salt. The value of the oil was then of course unknown, and old men who remember the sinking of the wells look back with curious wonder at their simplicity in trying to rid themselves of the precious treasure.

Salt in the Guyandotte Valley.—In the early settlement of the country salt was manufactured here in quantities adequate to the wants of the inhabitants.

Salt-water was obtained in abundance by boring to a very moderate depth. Especially was this so at Salt River which runs into the Guyandotte about 20 miles from its mouth. A well here of only a hundred feet in depth furnishes enough to supply two furnaces. Seven miles further up the river there is another well of equal yield, and there is no doubt of the abundance of salt springs all through the valley.

Abundance of Coal.—Prof. Locke, of Cincinnati, in his geological report on this subject says : “ The coal strata are numerous and of uncommon thickness, mostly from four to fourteen feet ; and at almost every section veins show themselves eight or ten feet in thickness. From my observations I am convinced that there are at least five strata extending along the Guyandotte where it runs through the range of mountains in Cabell County. The sum of the thickness of them would on an average probably equal that at Whitneyville, which is at the least, twenty-eight feet, the five opened veins being added together. The strata are most happily arranged, being grouped towards the base of the hills, so as to occupy the broadest area and to be the most accesible, while at the same time they are above the water and susceptible of perfect natural drainage.”

Another writer, whom we know to be eminently intelligent and trustworthy, says : “ Cabell County is the best cannel coal region in the world, and the exigencies of trade will bring it into market in a very few years.”

Prof. Buckman, an eminent English geologist, to whom we have just alluded, says : “ The average amount of coal measures in the different veins lying one above the other on the banks of the Guyandotte may be presumed to be nearly thirty feet, including the shales by which some of the veins are traversed.

After carefully examining these coal veins I was much impressed with the following important points :

First, The great thickness and regularity of the coal strata over extensive areas.

Second, The absence of any evidence of subsequent disturbance—there being absolutely no faults in the strata.

Third, The thick coal seam (the ten feet vein) being well covered with sandstone, so that in its mining there would be a good roof.

Fourth, The total impossibility of any inconvenience from water in the mines.

Fifth, The general convenient height of the coal mines above the level of the Guyandotte river. From the above data it will be seen that the expense of mining would be exceedingly small ; as there would be no shafts to make, the first day's mining would readily produce coal ready for market.

Still further testimony on this point is furnished by the official report of Professor Gill, to the "Board of Public Works" of Virginia. The report states that "the most valuable resources of the district appear to be the inexhaustible quantities of bituminous and lately discovered Cannel coal which appears to pervade the whole region of the country ; the measures sometimes lying in the bed and sides of the river and creeks to considerable extent, and at different altitudes in almost every hill in Cabell County. I have personally examined several of the measures of bituminous coal varying from two to seven and eight feet in thickness."

Prof. Sheppard in his report to the Board of Public Works, says :

"Between the strata or layers of these rocks are found, above the level of the streams, extensive beds of bituminous coal, generally one or two beds on every hill side of any magnitude. The beds that I

saw were found near the roadside, on a little creek ; it is here a workable bed of from four to five feet in thickness."

This is confirmed by the testimony of all scientific men who have visited the region. One who explored the region only a few months since says :

"The situation of the veins for mining is more favorable than any others I have ever met. The banks of the Guyandotte rise boldly from the water, the coal veins of unusual thickness cropping out nearly horizontally from the hill sides, at a convenient height for running the coal directly from the mouth of the mine into boats. I went into a mine on the west bank that had been worked three or four hundred feet into the hill and found ample room to stand erect and walk about with my hat on—and I am six feet high. The thickness and quality of the coal was found to improve as we advanced, and the drainage was the natural flow of the water from the mine.

I saw at Guyandotte a quantity of very superior Cannel coal, taken from a vein called Laurel Hill in Cabell County. I tried some of it by burning, and found it a very free burning coal, of the fat oily character most productive of coal oil. It is the opinion of good judges that oil can be manufactured from this article at a cost not exceeding three dollars a barrel."

The same writer adds in regard to the

Convenience of marketing Coal.—"At the time of my visit there was a good slack water navigation by means of locks and dams in the Guyandotte, from the mines to the Ohio River. The coal found a ready sale to steamboats on the Ohio river at remunerative prices,—the demand was greater than the supply. Nothing but capital is needed to increase the production of these mines to the extent of supply

ing the markets of Cincinnati and other places of the Ohio and Mississippi even down to New Orleans. And in addition to the river communication there might be a railroad of an easy descending grade constructed at a comparatively small cost."

Quality of the Coal.—The analysis by Prof. Locke shows that Guyandotte coal contains 56 1-2 per cent. carbon, 42 per cent. volatile matter, and only 1 1-2 per cent. ashes or refuse—less than any other coal in Western Virginia (except Deem's Vein at Big Senel Mountain, which gives 1.14) and less ashes or refuse than nine-tenths of the other specimens collected from all quarters of the earth. Its percentage of carbon and volatile matter agrees almost exactly with the English Lancastershire cannel, which has 56 per cent. carbon, and 38 per cent. volatile matter, and is reckoned as among the types of a perfect coal for the manufacture of illuminating gas.

Iron in the Guyandotte Valley.—That the valley contains extensive iron beds of excellent quality has been proved beyond a doubt, and what is also of great importance, there is abundance of limestone for fluxing the ore. Prof. Locke, who made extensive explorations in this region to test its resources, says in regard to its iron beds: The coal measures in the United States, as well as elsewhere, usually include limestone and iron ore; and accordingly I have found these two on these lands. The nodular or kidney ore occurs in the creeks, fields, and roads, scattered as if out of place. At Madison Creek and at other places I was able to trace the strata from which these nodules originated. A bluff, a little above Mike Wince's house, on the bank of the Creek, presents the following section, commencing at the bottom: Sandstone 1 ft.; shale, including nodules of iron ore 4 ft.; sand-

stone 3 ft. ; shale, including nodules of iron ore 11 ft.; sandstone 2 ft. ; iron ore and shale decomposed into copperas 3 ft. ; a thin seam of decomposing coal indefinitely blended with shale 2 ft. The bottom of this section is about 42 feet above low water at the mouth of Madison Creek. At another place there is an extraordinary mixture of coal and iron ore, of which the following would be an approximate section, beginning at the bottom ; Iron ore in a nodular stratum containing zinc 3 inches ; coal 4 ft. ; shale and iron ore 10 ft. ; shaly sandstone 10 ins ; coal 10 ft. ; shale, laminated 4 ft. ; iron ore in a stratum block ore, 4 ins ; shale, splitting readily like slate, 4 ft. The bottom of this section is about 33 feet above the level of Guyandotte river at the mouth of Four Mile Creek. Nodules of iron at the bottom of this section are peculiarly characterized, by having within them veins of the sulphur-ate of zinc, and sometimes calcin or carbonate of zinc."

Iron Ore on Tyler's Creek.—Lower down the river, at Tyler's Creek, the iron ore, according to Professor Locke, has been only partially exposed ; and, so far as seen, exhibits nodules similar to those at Dial's embedded in shale. That they belong to the same stratum is rendered highly probable by their containing the same metal--zinc--mostly, however, here in a white powder of carbonate of zinc. Height above low water at Salt Rock, 48 feet. It is now pretty evident that the great coal stratum at Trace Fork, the iron and coal at Dial's, the coal on both sides of the river at Chapman's, Cameron's Creek, the iron at Madison Creek, and the iron at Tyler's Creek, [embracing eight miles of the river] are all included in one great stratum of shale, and that the iron and the coal lie almost contiguous to each other. The same block ore of four inches in thickness is found at Dial's, and opposite

Cameron's Creek, at eleven ; the same nodules of iron containing zinc ore, are found both at Dial's and Tyler's Creek."

Prof. Shepherd, in his report to the Board of Public Works of Virginia, says of the iron resources of this valley—

" Above and between the coal beds are beds of clay, iron ore, and also carbonate of iron, in kidney-shaped masses. These beds vary from three to four feet in thickness. This latter ore contains lime mixed with iron. It is very compact and hard to break, free from all sulphur, and will probably yield on an average twenty-five per cent. of excellent bar iron ore, of the same description as is extensively worked on the Monongahela, in Pennsylvania. It exists here in sufficient quantities to supply the increasing demand for this most valuable of all metals."

The well known Prof. Rogers, in his report to the same Board, says—

" As conspicuous among the future sources of wealth and prosperity throughout this region, I may be permitted to call the attention of the Board [of Public Works of Virginia] to the extraordinary abundance and excellence of its iron ores."

Market Facilities.—A mere glance at the map will be sufficient to convince any one of the superior advantages of the Guyandotte for sending its products both agricultural and mineral to market. The whole of the river below Guyandotte is thickly populated, so that Cincinnati and the immediate townships thence to Louisville, Cairo, and the whole of the Mississippi, offer a market equal to the supply ; so that the prices could never be lowered, but would tend to increase with the increase of demand and means of supply.

These markets will be much more accessible from the Guyandotte river, as there are many shoals on the Ohio river above the mouth of the Guyandotte, which

prevent coal boats from navigating the river during low water in the summer, while there are no shoals below the Guyandotte to prevent such boats from going to market at any season of the year. This consideration alone will give the Guyandotte mines great advantage over all others above them.

The coal from these mines can always be regularly supplied at any season, which is not the case with those from a higher position up the Ohio. In short, from the vast quantity of minerals of different kinds, and the facilities for mining them, and the complete slack water navigation of the Guyandotte, there can be no reason why this valley, used only for mining purposes, should not yield enormous profits.

WHAT A CORRESPONDENT THINKS OF WEST VIRGINIA.

Before leaving West Virginia let me step aside from the direct purpose of this letter, and say a word in reference to the other great resources of this new sister State. Apart from oil, it is rich in great mineral resources. I was shown a lump of rudely refined ore at Sisterville, which seemed to be an alloy of silver, and which I was informed had been obtained in a neighboring hill. A joyous settler assured me, at Elizabeth that he had a *brass mine on his farm!* And another disconsolate borer, who had been sinking a well without many indications of oil, had placed over his derrick this despairing resolution: "Oil, silver, Hades or China." In the county of Pocahontas, iron ore is found producing 83 per cent. of pure metal, and lead, copper, and silver exist. Coal may be found cropping out of the ranges of the Western mountains, and rich veins of asphaltum have been found in Wirt county. In Morgan and Hampshire counties medicinal springs exist. The highest moun-

tain in the State is 2,500 feet, but the upper valley of the Kanawha is luxuriant in verdure, and as fertile and temperate as the counties further north. You can imagine the opportunities presented by West Virginia, when I say that while there are 2,346,137 acres of improved lands, 8,550,257 are unimproved. Before this oil excitement the lands averaged eight dollars an acre; now many undeveloped tracts have been refused at a thousand dollars. Although New Hampshire has but 40 per cent. of the territory of West Virginia, yet, under the more extended and vigorous system of improvement it surpasses it in every respect. Still, there is a great future for West Virginia, particularly when New Hampshire money and genius are introduced. In Mason and Kanawha counties salt has been found. These salt formations accompany the vast strata of sandstone that underlies the whole of the northwestern counties of Virginia, and the works were used by the rebel authorities. A few miles from Charlestown, on the great Kanawha, and in the line of the great upheaval the salt wells are very productive. They are several hundred feet in depth, yielding lime of remarkable purity, and free from sulphate of lime or gypsum, and crystallized with less trouble than customary, and sent into commerce as a superior muriate of soda. Mason county is also famed for salt mines, but the rebellion has quite ruined the manufacture, in consequence of rebel incursions and the dearth of labor. In the valley and in Preston county, iron furnaces are in operation and the ores of Laurel Hill are rich and pure. These ores occur in two groups upon the western slope, the upper group above the second seam of coal, resting upon a lead-colored sandstone, and overlaid by Silician slates. The ore is found in large nodules resembling sandstone and is easily blasted. The coal products of the State are boundless. The fields of the Kanawha Valley are among the most

valuable on the continent. Indeed, for salt, coal, iron, and probably Petroleum, West Virginia bids fair to rival, if not surpass any State of the Union. .

Before closing we will copy from a recently published pamphlet on Petroleum, the introductory remarks on Rock Oil and the origin of Petroleum. Those who wish more information on this subject, will do well either to buy a copy of the above mentioned pamphlet, or to subscribe to the weekly paper "All About Petroleum." The office of publication of this Petroleum journal is 34 Liberty-street, New York. Subscription price, \$5. •

ROCK-OIL, OR PETROLEUM.

The discovery of gunpowder supplanted the old system of warfare, with all its cumbersome siege instruments ; the discovery of printing by Guttenberg ; of the power of steam and electricity, and the discovery of the gold fields of California, exercised their influence upon the social history of the world ; while more recently, rifled cannon and iron-plated monitors have again revolutionized the system of warfare of the last century,—and now the discovery of a new material—petroleum—comes to exercise a yet incalculable influence upon the course of all industrial pursuits, exciting, at the same time, the attention of capitalists and others, not only to the product of the rock oil regions of this country, but also to these regions themselves, which are believed to extend from the southern portion of the Ohio valley to Georgian Bay on Lake Huron in Upper Canada, and from the Alleghanies in Pennsylvania, to the western limits of the bituminous coal fields in the vicinity of the Missouri river, embracing an area of about fifty thousand square miles, a vast amount of which is, of course, undeveloped.

WHAT IS PETROLEUM.

Many speculations have been indulged in about the origin of petroleum. Some think that it is the work of a coralline insect which exists underneath the coal formation in the rocks. Others insist that it was distilled by the heat of the eastern slope of the Alleghany mountains from the anthracite coal, and thence flowed to the western slope of those mountains. Others again believe that petroleum is produced from layers of coal which are submitted to a low heat, and thus a gas is evolved, which being mixed with water soaking through the crevices, becomes condensed. Many impressions of fishes having been found in the rocks, some have held the idea that petroleum comes from fishes and reptiles, destroyed by some geological change in the present oil districts.

Another theory of the formation of petroleum is, that petroleum being known to be a hydrocarbon, composed of two gases, these gases are primary elements, indestructible and exhaustless in quantity. One of them—hydrogen—is constituted of water, and of course is as exhaustless as the ocean. The other is a constituent in all vegetable forms and in many of our rocks. One hundred pounds of limestone, when burned, will weigh but sixty pounds. The part driven off by burning is carbonic acid gas. Underlying the Oil Rock is a stratum of limestone of unknown thickness, but known to be upwards of one thousand feet in depth. The water falling on the surface and percolating through the porous sandstone that overlies the oil rock, becomes charged with salt, potash, saltpetre and other chemical ingredients, and finally reaches the limestone rock and decomposes it—the carbon in the rock and the hydrogen of the water uniting to form oil, while the oxygen is set free to ascend to the atmosphere or unite with minerals and form oxydes.

The reverse of this process is seen in burning the oil in a lamp—the oxygen in the atmosphere uniting with the carbon in the oil, forming a carbonic acid, and with the hydrogen forming water, thus completing the circle.

According to all appearances, however, petroleum is the work of subterranean fires, which raise or sublime the more subtle parts of certain bituminous matters that lie in their way. These parts, being condensed into a liquor by the cold in the vaults of rocks, are there collected, and ooze thence through clefts and apertures, existing in the earth's strata.

Petroleum, then, is a liquid bitumen, only differing by its liquidity from other bitumens, as asphaltum, jet, amber, and the like substances. It is a fluid, resembling in a high degree the essential oil from vegetables. It is of a brownish-yellow color, and of a peculiar odor. Its specific gravity varies from .73 to .878. When exposed to a gentle heat for distillation, the fluid which comes over has less color, is much thinner, and has more smell. When it is exposed to the air, even that obtained by distillation, it becomes thick and highly colored, and puts on the form of bitumen.

WHERE PETROLEUM COMES FROM—THE BOWELS OF THE EARTH SCIENTIFICALLY OVERHAULED.

The subject of explaining the phenomena of the production of petroleum has attracted the attention of scientific and practical men ever since its discovery and adaptation to the uses of society. Several theories have been advanced, but the most reasonable which we have remarked, and which has been fortified by personal investigation in the oil region in Pennsylvania, may be ascertained from the following summary of the views of the most enlightened investigators in

the mysteries of this wonderful production of the earth :—

It seems certain that the principal supplies of petroleum are not diffused between the planes of stratification, but are collected in cavities more or less sunken in the strata, where it is less liable to be carried away by running water. It is common to find large quantities in places where there are marks of disturbance and misplacement of the rocks, and those who have professionally "prospected" for oil nearly always select such spots for sinking shafts or wells. These cavities are not usually of great horizontal extent—it is seldom that two neighboring wells strike oil at the same depth, whether the strata be horizontal or dipping; it is one chance out of many to strike oil at all, even in neighborhoods where it exists in abundance, except in certain localities in the oil creek region, where the average chances of striking oil are superior to those of other districts, with the exception, possibly, of some of the newly discovered districts in Western Virginia.

The pamphlet from which the above extract is made, is entitled "All About Petroleum, and the Great Oil Districts of Crawford and Venango Counties, Pa.," and gives not only a full history of petroleum, but also the most complete description of the Pennsylvania Oil Regions. It is for sale by all first class news-dealers, by the American News Company, 121 Nassau street, New York, or by the publisher, 34 Liberty street, New York. Price, 25 cents.

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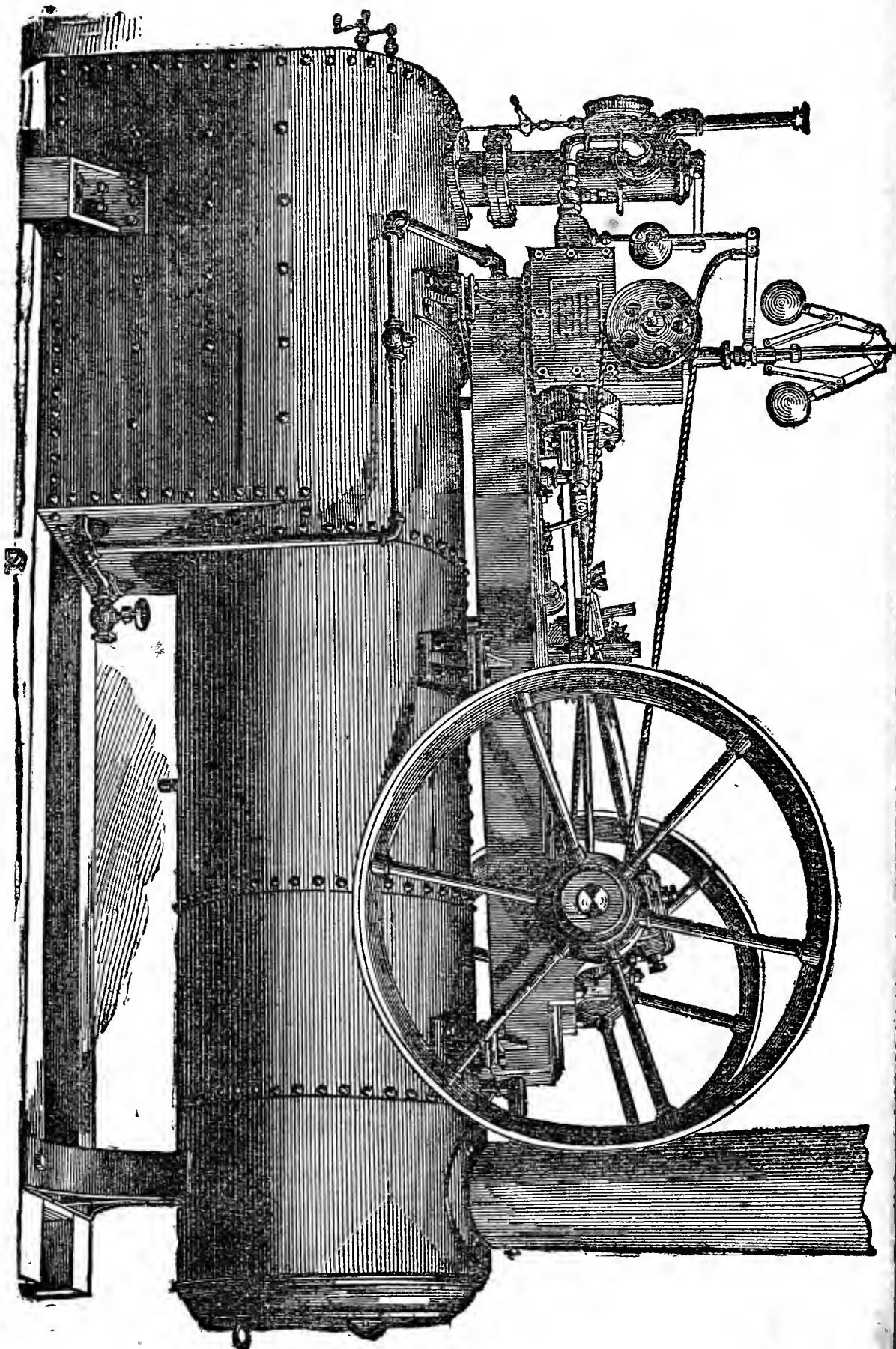
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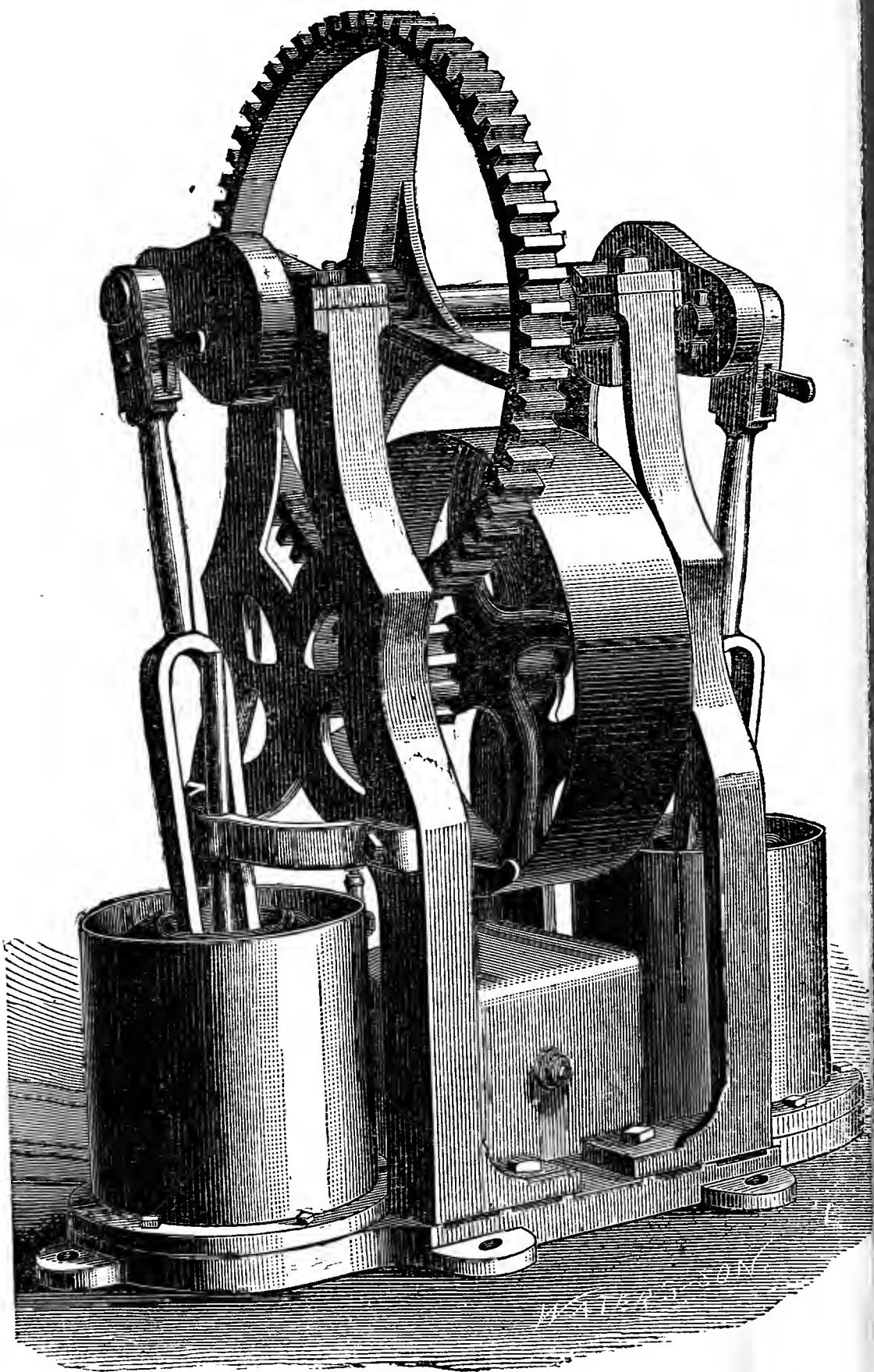
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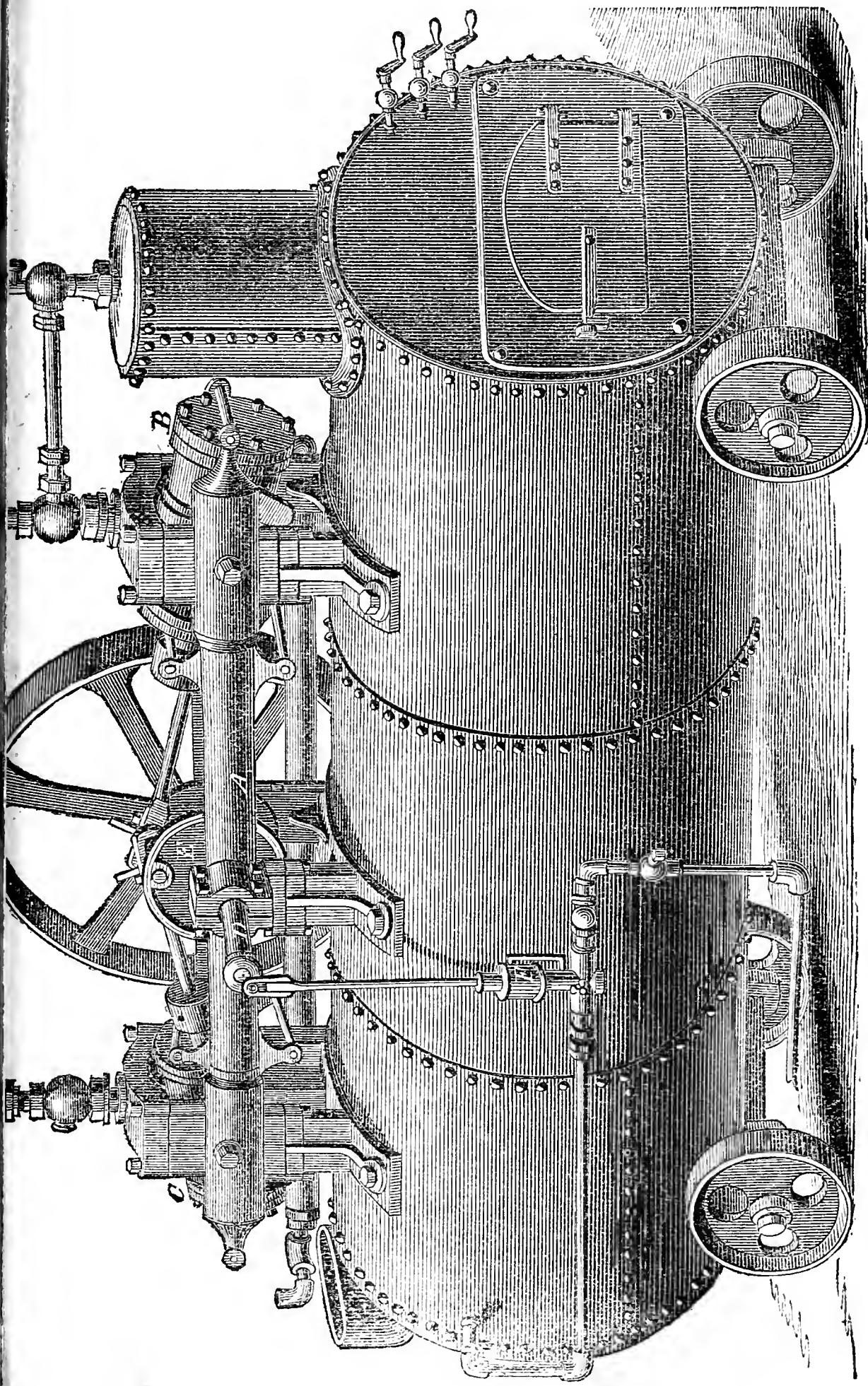
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